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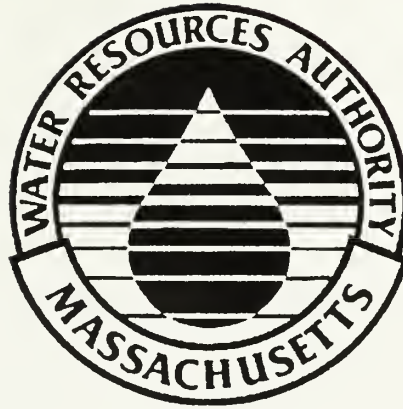
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Capital Improvement Program FY97-99

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Capital Improvement Program FY97-99

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CAPITAL IMPROVEMENT PROGRAM

FISCAL YEARS 1997 - 1999

August 1996



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August 5, 1996

Andrew Papastergion, Chairman
MWRA Advisory Board
11 Beacon Street
Boston, MA 02108

Dear Chairman Papastergion and Advisory Board Members:

This letter transmits to the Advisory Board the MWRA's Capital Improvement Program (CIP) for fiscal years 1997 to 1999. The MWRA Board of Directors adopted this budget on June 26, 1996, prior to the start of the new fiscal year on July 1.

The CIP forecasts annual capital spending for FY97 through FY06 and beyond, and the MWRA uses the financial information it provides in the formulation of rates and charges to user communities. The final budget is the result of the cooperative effort of the Advisory Board and the MWRA to produce a budget for the next three fiscal years which supports the MWRA's mission to provide reliable, cost-effective, high quality water and sewer services.

The FY97-99 CIP includes 78 projects comprised of more than 740 project phases. It provides a three-year budget of \$1.3 billion and a ten-year budget of \$3.1 billion for capital improvements to the MWRA wastewater and waterworks systems.

The Executive Summary of the main document presents an overview of anticipated capital spending for each MWRA capital program by division and fiscal year; the anticipated grant revenue and capital financing requirements needed to support the capital program; and the expected impact of operating new facilities on the current expense budget. The *CIP Supplement*, included as a separate document, presents detailed expenditure forecasts by project phase and fiscal year.

Highlights of the FY97-99 Capital Improvement Program

- ▶ **Commitment to Achieving Long-Term MWRA Policy and Program Goals.**
While the CIP includes several new capital initiatives, there are no significant shifts in policy direction or in the projected flow and volume of capital spending in the next ten years. The most recent review and approval of the final CIP undertaken with the Board of Directors affirmed the need for and importance of all projects included in the MWRA capital program.

- **Commitment to Improving Boston Harbor Water Quality by Completing the Boston Harbor Project.**
 MWRA has expended more than \$2.5 billion on the Boston Harbor Project to date, with FY94 marking the peak year of construction spending. Another \$623 million is required from FY97 through FY01 to successfully complete and begin full operation of all components of the project.
- **Commitment to Delivering Healthful Drinking Water.**
 The FY97-99 CIP marks the initial years of shifting MWRA capital resources from the construction of primary and secondary wastewater treatment facilities to the design and construction of capital facilities that supply, transmit, and protect drinking water. This includes construction of the MetroWest Tunnel, Norumbega and other covered storage facilities, and the Walnut Hill Water Treatment Plant. FY99 will mark the first year in MWRA history that Waterworks expenditures will surpass Wastewater expenditures as a percentage of total MWRA capital spending.
- **Commitment to Rehabilitating and Maintaining Existing Assets.**
 The MWRA has invested more than \$3 billion to date in the construction of new facilities and the rehabilitation of existing systems. As our organizational focus shifts from construction of new facilities to operational efficiency, reinvestment in and maintenance of existing assets becomes an ever increasing priority. System rehabilitation projects comprise 22% of the ten year capital budget: \$304 million for wastewater projects and \$388 million for waterworks projects.

FY97-99 CIP Budget Compared to the FY96-98 CIP Budget

The total cost of all planned and ongoing projects in the FY97-99 CIP, including prior year expenditures, is \$6.3 billion. This compares to \$5.9 billion in the FY96-98 CIP. The net increase of \$389.4 million is comprised of a \$190.4 million increase in the MetroWest Water Supply Tunnel budget; a \$138.5 million increase in the Boston Harbor Project budget; a \$55.1 million increase for new projects and project phases; and other budget adjustments for inflation of unawarded contracts and changes and additions to existing projects offset by some project reductions.

The FY97-99 CIP includes a ten-year budget (FY97-06) of \$3.085 billion, compared to the FY96-98 CIP ten year budget (FY96-05) of \$3.088 billion. The ten-year budget for the BHP decreased \$272.9 million compared to the FY96-98 CIP as a result of one less year of BHP spending (FY96 BHP expenditures were \$366.1 million) offset by a \$138.5 million increase in the total project budget. The Waterworks ten-year budget increased \$230.8 million, and the other Wastewater projects ten-year budget increased \$13 million compared to the FY96-98 CIP.

Projected Spending for Fiscal Years 97-99

The FY97-99 CIP provides for an estimated \$1.299 billion in capital spending for fiscal year 1997 through fiscal year 1999. This compares to \$1.102 billion for the same fiscal years in the FY96-98 CIP. The \$197 million increase in the three year budget is primarily comprised of a \$113.8 million increase in the BHP budget related to revised expenditure forecasts and budget increases; a \$53.2 million increase in the Waterworks budget related to revised expenditure forecasts and budget increases for the MetroWest Tunnel; and a \$32.6 million increase in the other Wastewater projects budget related to revised expenditure forecasts for CSOs, Braintree-Weymouth Relief Facilities, and other projects.

The Future

The MWRA remains committed to its rates management strategy and its mission to provide high quality, cost-effective water and sewer service to its customers. To this end, we continue to seek new cost saving measures to assure that every capital project is completed in the most cost-effective manner, and will continue to work to improve project cost and schedule accountability.

We look forward to continuing our work with the Advisory Board on these efforts, and as we begin the process of developing the MWRA's capital improvement program for FY98-00.

Sincerely,

A handwritten signature in black ink, appearing to read "Douglas B. MacDonald", with a long horizontal flourish extending to the right.

Douglas B. MacDonald
Executive Director

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EXECUTIVE SUMMARY



Executive Summary

What is the Massachusetts Water Resources Authority?	The Massachusetts Water Resources Authority (MWRA) is a quasi-public agency created by the Commonwealth of Massachusetts in 1985, with the responsibility for providing water service to 47 cities and towns, and collection and treatment of sewerage from 43 cities and towns. The MWRA operates and maintains waterworks and wastewater facilities located from the Quabbin Reservoir in western Massachusetts to Boston Harbor. (See service area map on page 21.)
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Mission of the MWRA	The MWRA's mission is to provide reliable, cost-effective, high quality water and sewer services that protect public health, promote environmental stewardship, maintain customer confidence, and support a prosperous economy.
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Wastewater and Waterworks Systems History	The MWRA inherited the wastewater and waterworks systems from the Metropolitan District Commission, an agency that did not possess the institutional and financial ability to maintain reliable service and meet environmental regulatory requirements. The MWRA inherited a backlog of scores of projects, at a projected cost of more than \$1 billion, that addressed only immediate service delivery problems. Since 1985, the Authority has made significant progress in addressing these problems. In addition, the MWRA assumed the formidable task of eliminating wastewater pollution in Boston Harbor by constructing a new primary and secondary treatment plant on Deer Island. The MWRA is also now moving ahead on several major waterworks distribution and treatment projects designed to ensure that it will continue to reliably transport water from the Quabbin and Wachusett Reservoirs to the distribution reservoirs in western metropolitan Boston, and that this water will be treated and stored to maintain its high quality and meet federal safe drinking water requirements. These projects include the MetroWest Tunnel, the Wachusett Water Treatment Plant, and construction of several covered storage distribution facilities.
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The Capital Improvement Program

This Capital Improvement Program (CIP) presents plans for capital investment in 78 projects at an estimated cost of \$1.3 billion for FY97-99.¹

Highlights of the FY97-99 Capital Improvement Program

- While the CIP includes several new initiatives, there are no significant changes from the FY96-98 CIP in policy direction or in the projected flow and volume of capital spending in the next ten years.
- MWRA has expended more than \$2.5 billion on the Boston Harbor Project to date, with FY94 marking the peak year of construction spending. Another \$623 million is required from FY97 through FY01 to successfully complete and begin full operation of all components of the project.
- The FY97-99 CIP marks the initial years of shifting MWRA capital resources from the construction of wastewater treatment facilities to the design and construction of facilities that supply, transmit, and protect drinking water. This includes construction of the MetroWest Tunnel, Norumbega and other covered storage facilities, and the Walnut Hill Water Treatment Plant. FY00 will mark the first year in MWRA history that Waterworks expenditures will surpass Wastewater expenditures as a percentage of total MWRA capital spending.
- The MWRA has invested more than \$3 billion to date in the construction and rehabilitation of new and existing facilities and systems. As the Authority's organizational focus shifts from construction of new facilities to operational efficiency, reinvestment in and maintenance of existing assets becomes an ever increasing priority. System rehabilitation projects comprise 25% of the ten year capital budget.
- The CIP includes a new financial assistance program to provide member communities with grants and loans from the MWRA to fund local water infrastructure projects. For the wastewater system, the I/I program will continue at its current funding level, and the portfolio of local sewer improvement projects included in the CSO System Optimization Program is scheduled for completion in FY97.

1. The FY97-99 CIP budget is stated in December 1996 dollars, including estimates for future project phases (unawarded contracts) which have been inflated by 2.4% to bring their value to a December 1996 benchmark. The 2.4% represents projected inflation for the period December 1995 to December 1996, and it is based on the Boston Construction Cost Index published by the *Engineering News Record*. The inflation factor of 2.4% is a reduction from the FY97-99 Proposed CIP budget which estimated inflation at 3.4%. Budget estimates in this CIP document do not include future inflation.

The MWRA has already undertaken substantial work on many of the projects in the CIP, as authorized in prior capital budgets, and anticipates that all projects included in this document will begin by FY06. Estimated expenditures on all projects from the Authority's inception in 1985 through the end of FY96 are \$3.4 billion. The total projected capital investment for the ten-year period FY97-06 is \$3.1 billion.

For the twenty one-year period 1985-2006, the MWRA is projected to spend \$6.5 billion, nearly 70% of which will support improved wastewater interceptor and treatment systems.

For the upcoming decade, the table below presents projected spending by fiscal year, with the "Boston Harbor Project" and "Other Wastewater Projects" comprising the total Wastewater capital program, and "Contingency" and "Administration" comprising the total Administration capital program.

PROJECTED EXPENDITURES BY PROGRAM

(in millions)

Program	FY 97	FY 98	FY 99	FY 97-99 Total	FY 00- 2006	10-Year Total
Boston Harbor Project	\$241.5	\$186.9	\$145.5	\$574.0	\$49.2	\$623.2
Other Wastewater Projects	\$76.7	\$55.3	\$45.6	\$177.6	\$464.5	\$642.1
Waterworks	\$101.8	\$165.6	\$160.8	\$428.2	\$1,058.6	\$1,486.8
Administration	\$8.7	\$3.3	\$1.7	\$13.7	\$11.7	\$25.4
Contingency	\$27.9	\$40.2	\$37.2	\$105.2	\$201.9	\$307.1
TOTAL	\$456.6	\$451.3	\$390.8	\$1,298.7	\$1,785.9	\$3,084.6

Significant Accomplishments

Since its inception in 1985, MWRA has completed 84 capital projects, made substantial progress on many others, and spent more than \$3 billion. Among its major accomplishments, the Authority:

Boston Harbor Project

- Through May 1996, completed 81% of construction physical progress for the Boston Harbor Project.
- Through May 1996, mined 8.9 miles of the Effluent Outfall Tunnel.
- On February 22, 1996, completed the South System Pump Station and functional testing of the eight pumps. The contractor is performing preventive maintenance on the pumps until the Inter-Island Tunnel is completed.
- On December 8, 1995, declared the Residuals Treatment Facility - Phase I (Module No. 2) substantially complete.
- On November 4, 1995, completed the 4.8 mile Inter-Island Tunnel bore from Deer Island to Nut Island. Concrete lining operations began in January 1996. A total of 4,938 feet, or 19% of the tunnel has been lined through May 1996.
- In January 1995, began primary treatment of wastewater in the first two batteries of the new Deer Island Treatment Plant.
- In March 1993, began initial distribution of fertilizer pellets produced at the residuals management facility, and in FY95 substantially completed fast-track equipment installation for plant expansion.
- In December 1991, began operation of the Fore River residuals management facility, ceasing the discharge of wastewater sludge and scum into Boston Harbor.

Other Wastewater Projects

- In March 1996, substantially repaired the breach to existing Outfall 002 at Deer Island.
- In 1995 substantially completed rehabilitation of the Alewife Brook Parkway Pump Station and the Cottage Farm CSO Ventilation System.
- In 1994, adopted a revised conceptual Combined Sewer Overflow (CSO) plan, which will save ratepayers several hundred million dollars compared to an earlier plan to address the problem.
- In October 1992, completed the Clinton Wastewater Treatment Plant.

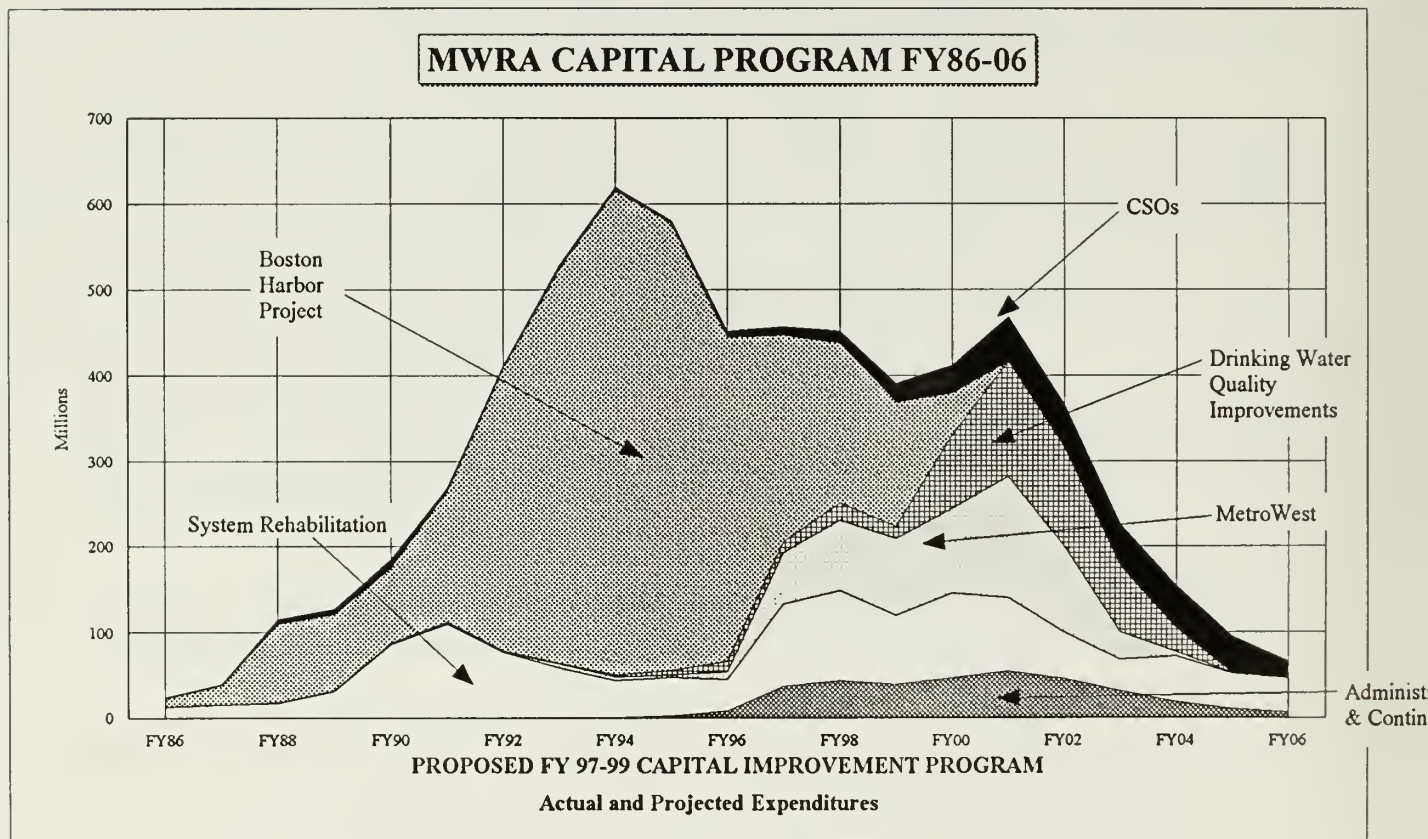
Waterworks Projects

- On May 22, 1996, awarded Construction Contract 2, the largest segment of the MetroWest Tunnel project.
- In July 1995, completed monitoring of the Reservoir Road Pump Station at the Chestnut Hill Operations Control Center.
- In 1995, awarded a contract to reconstruct three pumping stations (Lexington St., Newton St., and Spot Pond) with a combined pumping capacity of 85 million gallons per day.
- In October 1994, completed construction of two major transmission mains (18 miles) and in October 1995 began construction of a third main (three miles) which serve the Northern High System.
- In December 1994, selected the Walnut Hill site as the preferred location for a new water treatment facility.
- In 1994, substantially completed replacement of community water revenue meters at 130 sites.
- In 1993, upgraded and replaced chlorination facilities at Weston Reservoir and in 1989 at Norumbega Reservoir.
- In 1993, completed a corrosion study which identified pipes with the most serious corrosion problems and completed the draft Waterworks 20-Year Master Plan.

A full listing of completed MWRA capital projects appears in Appendix A of this document.

MWRA Actual and Projected Capital Spending

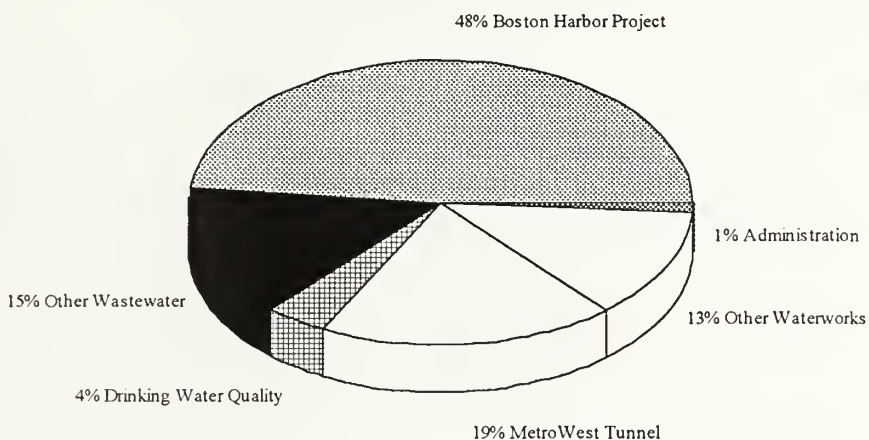
The graph below illustrates actual capital spending from FY86 through FY96 and projected spending from FY97 through FY06. Peak spending for the Boston Harbor Project occurred in FY94. Peak spending for the MetroWest Tunnel and Drinking Water Quality Improvements is expected to occur in FY01.



The graphs below depict the MWRA's three-year and ten-year spending plans by major projects and the sum of projected spending for other projects by capital program area. The graphs illustrate the shift in capital spending from the Boston Harbor Project to Waterworks projects.

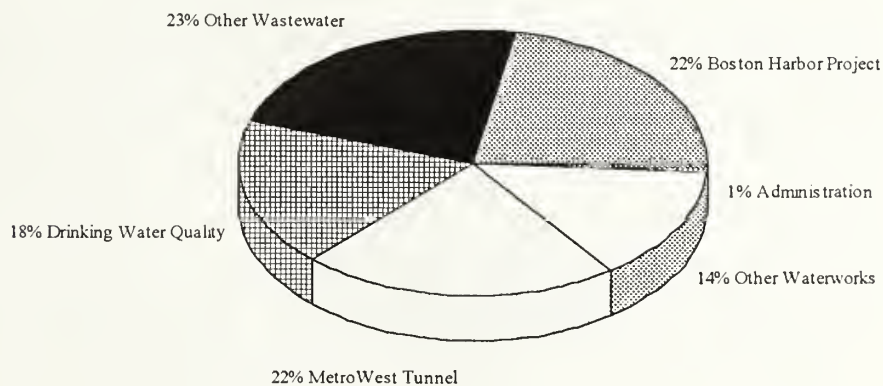
Percentage of Projected 3-Year Capital Spending

FY1997-FY1999



Percentage of Projected 10-Year Capital Spending

FY1997-FY2006



WASTEWATER PROGRAM

Overview The Wastewater capital program continues modernization of the antiquated wastewater collection system inherited from the MDC to meet current and future demand, and to dramatically improve the level of wastewater treatment.

Program Categories MWRA divides the Wastewater program into five categories: Interception and Pumping, Treatment, Residuals Management, Combined Sewer Overflows (CSOs), and Other Wastewater Projects.

Interception and Pumping The Interception and Pumping category includes 15 projects to improve the sewage collection and pumping system at an estimated cost of \$425.9 million. MWRA plans to construct five new relief and replacement interceptor sewers in the southern collection system at a cost of \$307.1 million. These interceptor projects entail installation of approximately 56 miles of pipeline, gravity sewers, and siphons; construction of three new pump stations; and a construction of 2.9 mile deep rock tunnel. Two projects, the New Neponset Valley Relief Sewer and the majority of the Framingham Extension Relief Sewer, are scheduled for completion in 1996 and 2000, respectively. The Authority expects to complete the Wellesley Extension Sewer Replacement Project in 2000. Braintree-Weymouth Relief Facilities are scheduled for completion in 2002.

The Interception and Pumping category also includes three pump station rehabilitation projects in Quincy. The existing stations are from 50 to 85 years old, and cannot handle existing sewage flows or need rehabilitation of existing equipment. MWRA will complete the Quincy Pump Facilities Project in 2001.

In the northern collection system, MWRA plans to complete rehabilitation of the North Metropolitan Trunk Sewer in 1998 at a cost of \$20.2 million. In addition, this budget includes a \$4.2 million project for facilities planning, design, and construction of the Cummingsville Replacement Sewer to address sewerage surcharging and overflow problems. MWRA expects to complete the Cummingsville project in 2002.

Many siphon chambers and diversion structures in the wastewater system are inaccessible for maintenance, resulting in debris accumulation, poor flow conditions, and serious odor problems. The CIP includes a project to inspect all structures and identify methods to improve accessibility and the transport of flows. The Authority plans to complete facilities planning in 1997.

The CIP includes four new Interception and Pumping projects at a cost of \$20.4 million:

- System Master Plan Interceptors, the largest new project, will provide for the rehabilitation or replacement of five wastewater interceptors at a total cost of \$18.4 million.
- The Ashland Extension Sewer project, mandated by the state legislature, is a \$1 million planning and design phase to determine the feasibility of extending the Framingham Extension Relief Sewer to Ashland.
- A \$752,000 Wastewater Facilities Rehabilitation project will focus on maintaining the Sewerage Division's existing facilities.
- A \$702,000 Corrosion and Odor Control study will identify the causes and sources of odors that affect the structural integrity of pipes and pump stations.

Wastewater Treatment

The Treatment category includes the Authority's most significant wastewater project, the federal court mandated Boston Harbor Project (BHP). The primary component of the BHP is the new Deer Island Primary and Secondary Treatment Plant. When complete the new plant will have the capacity to process 1.27 billion gallons of wastewater per day (bgd) for primary treatment and 1.08 bgd for secondary treatment. Construction of the plant and related facilities is an 11 year endeavor and will cost approximately \$3.5 billion. The new Deer Island plant will be the second largest treatment plant in the United States and will serve the majority of MWRA service communities in the Metropolitan Boston region. A more detailed discussion of the plant is found in the narrative for CIP project #1204, Deer Island Primary and Secondary Facilities. The new plant replaces two existing primary plants: the Deer Island plant, built in 1968, and the Nut Island plant, built in 1952. The first phase of the new plant began operation in January 1995 and the Authority de-commissioned the old Deer Island plant.

The Wastewater Treatment category also includes two projects to rehabilitate existing facilities. Improvements to the three Deer Island headworks facilities, begun in 1987, will be completed in 1997 at a cost of \$3.5 million. In addition, the budget includes a project to repair a breach in one of the existing outfall pipes at the Deer Island Treatment Plant at a cost of \$1.3 million.

Residuals Management	The new Deer Island Treatment Plant requires the addition of residuals management facilities, on and off Deer Island, to effectively treat, reuse, and dispose of treatment by-products. Total off-island residuals management capital costs are estimated to be \$151.9 million, including \$98.4 million for the construction of the sludge pelletizing plant at the Fore River Staging Area in Quincy. Operation of the plant began in December 1991. This budget includes \$53.5 million for plant expansion to accommodate increased sludge volume generated by the new Deer Island Treatment Plant.
Combined Sewer Overflows	The Wastewater program also includes a region-wide facilities plan and portfolio of construction projects to provide management and control solutions for combined sewer overflows (CSOs). The region-wide CSO control facilities are now projected to cost \$381 million. This is a reduction of more than \$580 million from the \$961 million included in the FY95-97 CIP, and a reduction of \$819 million from the MWRA's initial CSO Master Plan. The new plan differs markedly from the Authority's 1990 CSO recommendation to construct a series of holding tunnels. The new plan, based on updated information on wastewater flows, calls for the construction of 24 local CSO controls to address the different water quality needs of the various receiving water segments in Boston Harbor and its tributaries.
Other Wastewater Projects	The only project in this category, the Infiltration/Inflow (I/I) Local Financial Assistance Program, provides financial incentives to communities to rehabilitate their collection systems to structurally reduce I/I flows. The FY97-99 budget for the I/I program is \$15.9 million.

WATERWORKS PROGRAM

Overview

MWRA is committed to providing safe, high quality drinking water to its customers. In support of this goal, the Authority is undertaking a major waterworks capital initiative to ensure that the treatment, transport, and storage of water meets the highest quality standards and complies with state and federal regulatory requirements. The key projects of the initiative are the MetroWest Tunnel, the Walnut Hill Water Treatment Plant, and several covered storage projects.

While the wastewater system in general, and the Boston Harbor Project in particular, have been the focus of prior capital budgets, MWRA has made significant progress in the waterworks area, completing the rehabilitation of water pipelines in Stoneham, Woburn, Everett, and Chelsea; rehabilitation of the Oakdale hydroelectric power generator; a new chlorination facility at Norumbega Reservoir; and PCB and asbestos abatement programs.

Program Categories

MWRA divides the Waterworks capital improvement program into four categories: Supply and Treatment, Transmission, Distribution and Pumping, and Other Waterworks Projects.

Supply and Treatment

The Supply and Treatment category includes capital projects necessary to improve and preserve drinking water quality. MWRA maintains seven active surface reservoirs and storage facilities associated with the supply and treatment of potable water: the Quabbin, Wachusett, Weston, Norumbega, Nash Hill, Fells, and Spot Pond reservoirs. A fundamental component of the long-term plan to improve drinking water quality is the construction of the Walnut Hill Water Treatment Plant, a 450 million gallons per day treatment facility sited at the Wachusett Reservoir. The plant will include disinfection, corrosion control, and enclosed storage facilities, and may include a filtration component if current watershed protection efforts are not deemed adequate to meet state and federal water quality standards. The decision to include filtration will be made by 1998, the current schedule established with the Commonwealth's Department of Environmental Protection (DEP). Construction of a water treatment facility with a full filtration component, the Norumbega covered storage facility, and the construction of an Interim Corrosion Control facility are estimated to cost \$506 million and be completed by the year 2004.

As part of a complementary strategy to protect source water and actively treat drinking water supplies, the budget includes projects designed to preserve and

protect the natural watersheds which supply the Quabbin and Wachusett reservoirs. The Watershed Protection project includes MWRA's contribution of \$8.6 million for the construction of wastewater interceptors for the towns of West Boylston and Holden, which are located in the Wachusett Reservoir watershed. A watershed protection plan for the Sudbury Reservoir, the MWRA's only emergency water supply source, is also underway.

Transmission

The MWRA water transmission system extends from the Quabbin Reservoir in western Massachusetts to metropolitan Boston. The system consists of a series of tunnels, aqueducts, and pipelines which transport water from supply reservoirs to user communities. The current transmission system lacks redundant capacity to ensure continuous supply in the event of flow impairment in any aqueduct. The MetroWest Tunnel will address this deficiency and other projects are under study to provide redundant capacity.

The MetroWest Tunnel will provide redundancy for the Hultman Aqueduct, which transmits 85% of the water to the service region. The new 17.5 mile tunnel is expected to be operational in 2004, when it will become the system's primary transmission line. MWRA is also designing several other major projects in accordance with the tunnel's planned configuration and operational mode. The construction schedules for the Norumbega covered distribution storage facility and the Walnut Hill Water Treatment Plant have been adjusted in this budget to coincide with the anticipated completion date for the MetroWest Tunnel.

The CIP includes \$214,000 for a preliminary study for the Northern Tunnel Loop which is expected to begin in FY98. The Northern Tunnel Loop may provide redundancy for other critical elements of the transmission system including the City Tunnel, the City Tunnel Extension, and the Weston Aqueduct Supply Main (WASM) #3. The project, in its current configuration, will consist of a 16.5 mile, 12-foot diameter deep rock tunnel running from the Norumbega covered storage facility in Weston to the terminus of the City Tunnel Extension in Malden.

Other projects in this category provide additional transmission system improvements, and include projects to replace control valves and sluice gates at the Wachusett and Sudbury Reservoirs, and to provide a redundant water supply for the communities served by the Chicopee Valley Aqueduct through a series of connections to non-MWRA water systems in Springfield and Holyoke. The budget for these projects, scheduled for completion by 2004, is \$12.3 million.

Distribution and Pumping

The water distribution system within the metropolitan Boston area includes 265 miles of pipelines, many of which have inoperable valves and severely restricted carrying capacity. Most of the pipelines are between 40 and 100 years old and are reaching the end of their useful lives. Almost 20% are more than 100 years old, and approximately 75% are unlined. The MWRA has developed a renewal and replacement program to assure reliable service, prevent leakage, and preserve water quality.

The Distribution and Pumping category includes an extensive renewal and replacement program for distribution system components such as pipelines, valves, covered storage facilities, and pumping stations. The category includes projects to rehabilitate 75 miles of pipeline, replace 42 miles of pipeline, and construct 36 miles of new water mains at a total cost of \$481 million. The pipeline renewal program began in 1990 and will continue into the next century.

Additionally, the water distribution system requires investment in revenue meter modernization. This will result in more accurate billing of customer communities for water supplied by the MWRA. Data from the new meters and telemetry system permits the MWRA to monitor flows throughout the system and more precisely monitor actual water use. The revenue meter project includes installation of 130 meters. The first two phases of the project were completed in 1994 at a cost of approximately \$12.9 million. The remaining phases have been incorporated into appropriate capital projects and the costs have been allocated accordingly.

The Distribution and Pumping category also includes \$200,000 for a cathodic protection study and \$12.1 million to fund valve replacements through 2006. Cathodic protection systems retard corrosion on steel pipelines. Blow-off valve replacements reduce the risk of contamination of the water in the distribution system (blow-off valve equipment purchases for in-house construction projects are included in the MWRA's Current Expense Budget). Mainline valves permit the isolation of pipe segments to facilitate service and repairs.

In concert with the pipeline rehabilitation and replacement projects described above, MWRA will modernize and rehabilitate four pump stations, and investigate the rehabilitation requirements of the system's five remaining pump stations. The existing stations range in age from 30 to 90 years and many of them still operate with their original equipment.

**Other
Waterworks
Projects**

This category includes projects for equipment replacement, building and bridge repairs, central monitoring system development, mapping, and the Local Water Infrastructure Rehabilitation Assistance Program. The budget includes a new \$4 million Facilities Maintenance Program phase in the Rehabilitation of Existing Facilities project. The budget for these projects expected to continue through 2006 is \$22.3 million.

ADMINISTRATION PROGRAM

Overview Capital projects included in the Administration program have an Authority-wide focus, and assist the Wastewater and Waterworks Divisions in achieving service goals.

Project Status The Administration Program includes four projects plus the MWRA's capital budget contingency funds. The four projects are: North Maintenance Facilities, Fore River Staging Area, Technical Assistance, and the Business Systems Plan.

- North Maintenance Facilities: Plans continue for the development of a site for the North Maintenance Facilities.
 - Fore River Staging Area: Includes two new phases and two transferred phases (FRSA Upland Ph II and Hazardous Waste) from the Boston Harbor Project and Sewerage Division, respectively. The new phases address immediate needs such as appropriate shelving for storage of geological core samples and replacement pumps for the de-watering of dry docks.
 - Business Systems Plan: The Business Systems Plan includes a new phase designed to address continuing information technology needs and emphasizes eight elements designed to enhance the ability of employees to work more productively.
-

Contingency Funds The MWRA maintains two Capital Budget Contingency funds for each fiscal year, one for the Boston Harbor Project, and one for all other projects. The funds are included in the CIP budget to provide a mechanism to address unanticipated or unpredictable changes associated with capital projects. Transfers from the contingency funds to the budget for a capital project phase can be made at any time during the fiscal year. Such transfers occur when the Executive Director authorizes or the Board of Directors approve either a contract award amount higher than the budgeted figure for a project phase, or change orders/contract amendments that result in costs greater than budgeted. The Rates and Budget Department prepares monthly reports on current and cumulative transfers from the contingency funds.

CAPITAL FINANCING AND GRANT REVENUES

Capital Program Financing

The MWRA uses two primary sources of funds to finance its capital program: proceeds from borrowing and grant funds. In January 1990, the MWRA completed its first revenue bond issue for \$836.3 million. The MWRA used the proceeds to retire all outstanding bond anticipation notes and to replenish the water and sewer capital construction funds. Subsequent issues have brought total outstanding revenue bonds to \$2.6 billion as of June 30, 1996. The MWRA is currently rated an A credit by Standard & Poor's (S&P), Moody's, and Fitch.

In addition, the MWRA has borrowed from the Commonwealth's Water Pollution Abatement Trust, also known as the State Revolving Loan Fund (SRF). The gross amount of outstanding debt from the SRF as of June 30, 1996 is \$298 million. The net amount of outstanding SRF debt, assuming payment of contract assistance by the Commonwealth, is \$244 million. Finally, in FY95 the Authority initiated a tax-free commercial paper program to increase its borrowing flexibility and reduce interest costs. Outstanding commercial paper totaled \$255 million as of June 30, 1996.

The MWRA budgets for bond principal and interest payments in its annual Current Expense Budget (CEB). In FY97 the debt service budget is \$164 million net of \$39 million for debt service assistance from the Commonwealth of Massachusetts. As a result of the long-term financing necessary to fully implement the capital program, the Authority anticipates that annual debt service payments will continue to increase each year at least through 2004.

Grant Revenues

Grant receipts are also a significant source of funds, estimated to total \$691.4 million through June 30, 1996. The following table presents projected combined receipts from federal and state construction grant programs, as well as from special federal grant appropriations (including the Section 513 Program), for FY97-99 and beyond. Total grant support is projected to be \$148.7 million or 11.5% of expenditures in the three-year budget period.

PROJECTED GRANT REVENUE
(\\$000)

Grant Program	FY 97	FY 98	FY 99	Total FY 97-99	Beyond FY 99
Construction Grants	\$4,745	\$696	\$6,000	\$11,441	\$17,067
Special Federal Grants	\$84,315	\$25,311	\$27,655	\$137,281	\$165
TOTAL	\$89,060	\$26,007	\$33,655	\$148,722	\$17,232

After projected FY97-99 grant revenue is subtracted from capital requirements, the amount that the MWRA must finance is \$1.1 billion, as shown below.

CAPITAL BUDGET FINANCING REQUIREMENT
(\\$000)

Program	Total FY 97-99 Capital Requirements	Projected Grant Receipts	Total FY 97-99 Rate Payer Financing Requirements
Wastewater	\$751,551	\$148,722	\$602,829
Waterworks	\$428,212	0	\$428,212
Administration	\$13,722	0	\$13,722
Contingency	\$105,217	0	\$105,217
TOTAL	\$1,298,702	\$148,722	\$1,149,980

**Grant and
Loan
Assumptions**

The MWRA has made the following assumptions in this budget concerning financial assistance programs:

- Federal Title II Construction Grants Program

No new grant awards. A very limited amount of funds may be available to provide grant increases during FY97 to cover increased contract costs and to close out grants during FY97-00.

- Special Federal Grants

The federal government has appropriated \$579 million in support of the MWRA's wastewater capital program. This includes \$50 million appropriated in FY96 for the Boston Harbor Project. This budget assumes no further appropriations. The MWRA will continue to pursue additional federal appropriations.

- Massachusetts Grants Program

Some state funds will be available to provide increases to cover increased contract costs and to close out grants during FY97-00.

- State Revolving Loan Fund

The MWRA has received \$319.5 million in loans to date from the SRF, and expects to receive an additional \$60 million in FY97. Any additional loans are dependent upon reauthorization of the Clean Water Act. Terms of SRF loans are expected to be more favorable than those available in the revenue bond market.

Loans will have a 20-year maturity with repayment beginning two years after the date of the loan.

This budget assumes no SRF loans for drinking water projects. The MWRA will continue to support federal legislation to create a drinking water SRF and will pursue any funds that may be appropriated.

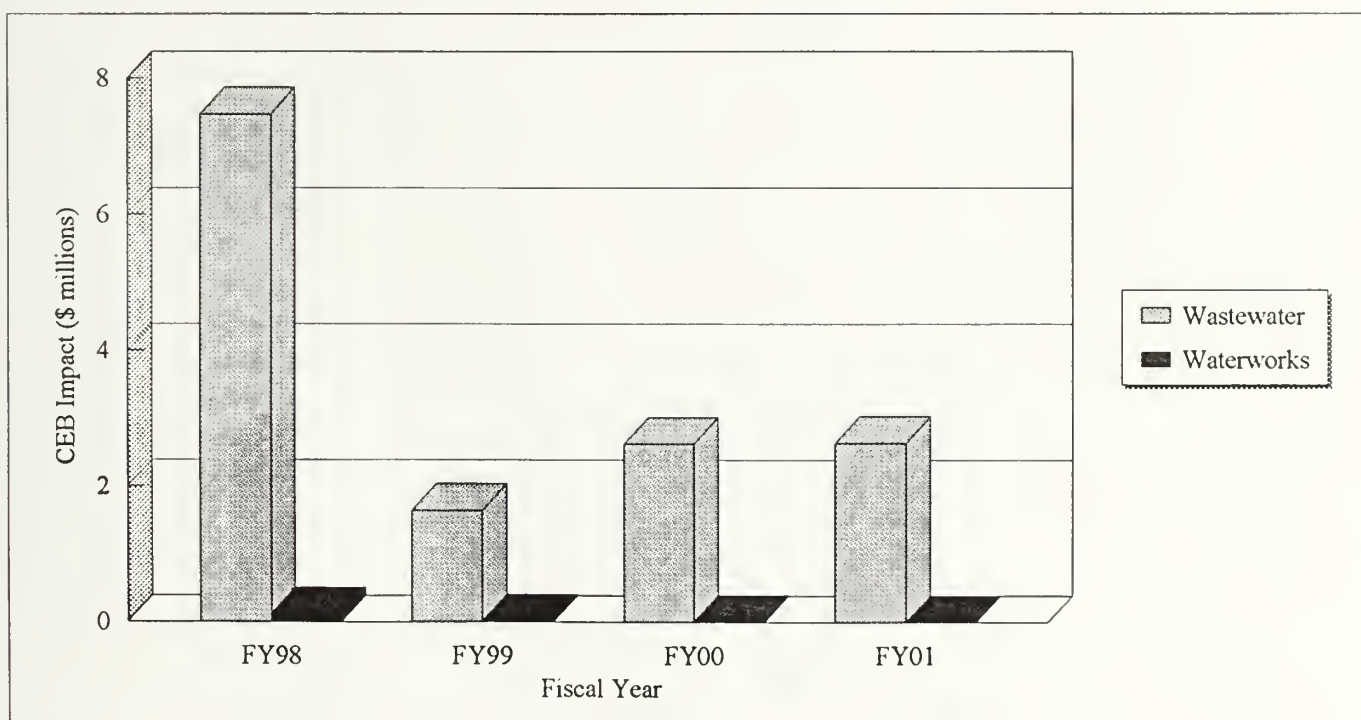
IMPACTS ON THE CURRENT EXPENSE BUDGET

Impacts of New Operations




The Capital Improvement Program affects annual operating budgets when capital facilities come on-line, requiring adjustments to staffing levels and other operating expenses. The project descriptions in this document provide information concerning the projected amount and timing of the CEB impacts for the years beyond FY97.

The following graph summarizes, by program, the estimated incremental impact of added operating costs on the MWRA's Current Expense Budget from FY98 through FY01.

**ANNUAL INCREMENTAL CURRENT EXPENSE BUDGET IMPACT
OF THE FY97-99 CAPITAL IMPROVEMENT PROGRAM**
(in millions)



MWRA SERVICE AREA

-  Water Only
-  Sewer Only
-  Both Services





WASTEWATER





WASTEWATER IMPROVEMENT PROGRAM
AND
CAPITAL EXPENDITURE BUDGET
FY 1997 - FY 1999

Introduction

The MWRA's wastewater system consists of collection, transport, pumping, treatment, and disposal of sewage received from 43 communities serving more than two million people. The Sewerage Division is responsible for operation and maintenance of the system including 230 miles of interceptor sewer lines, nine pumping stations, four headworks, three treatment plants, and six combined sewer overflow facilities for the screening and chlorination of combined sewerage and stormwater. The wastewater system receives sewerage flows from 5,400 miles of city and town sewers at 1,823 connection points.

The Sewerage Division is responsible for identification of the wastewater system's capital needs, including planning, design, and construction of all capital improvements.

Capital Budget Summary

The Wastewater improvement program budget for the three year period FY97 - FY99 is \$751.6 million. The program is comprised of five program categories: Interception and Pumping, Treatment, Residuals Management, Combined Sewer Overflows, and Other capital projects. The table on the following page presents projected expenditures in each of the five program areas. Retainage payments due for completed projects are also included in the totals. These figures include expenditures for which the Authority expects to receive reimbursement under federal and state grant programs.

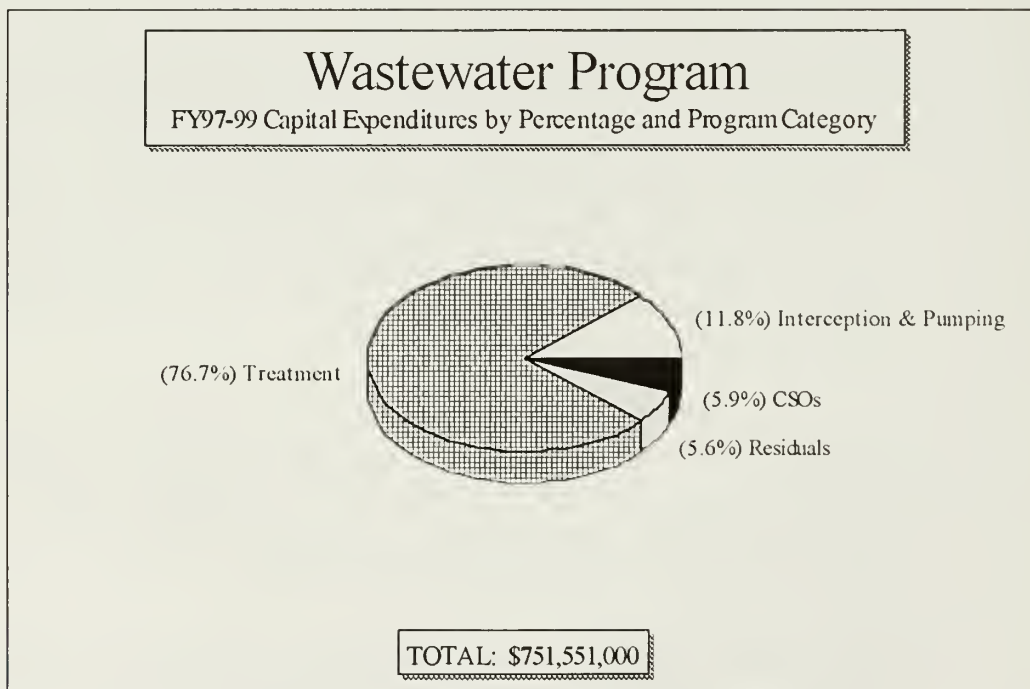
An additional \$525.2 million in expenditures beyond FY99 will be needed for project phases scheduled for completion after June 30, 1999. This figure includes the current estimated cost of construction of the Deer Island Secondary Treatment Plant, additional residuals management facilities, and a long-term program for control of combined sewer overflows.

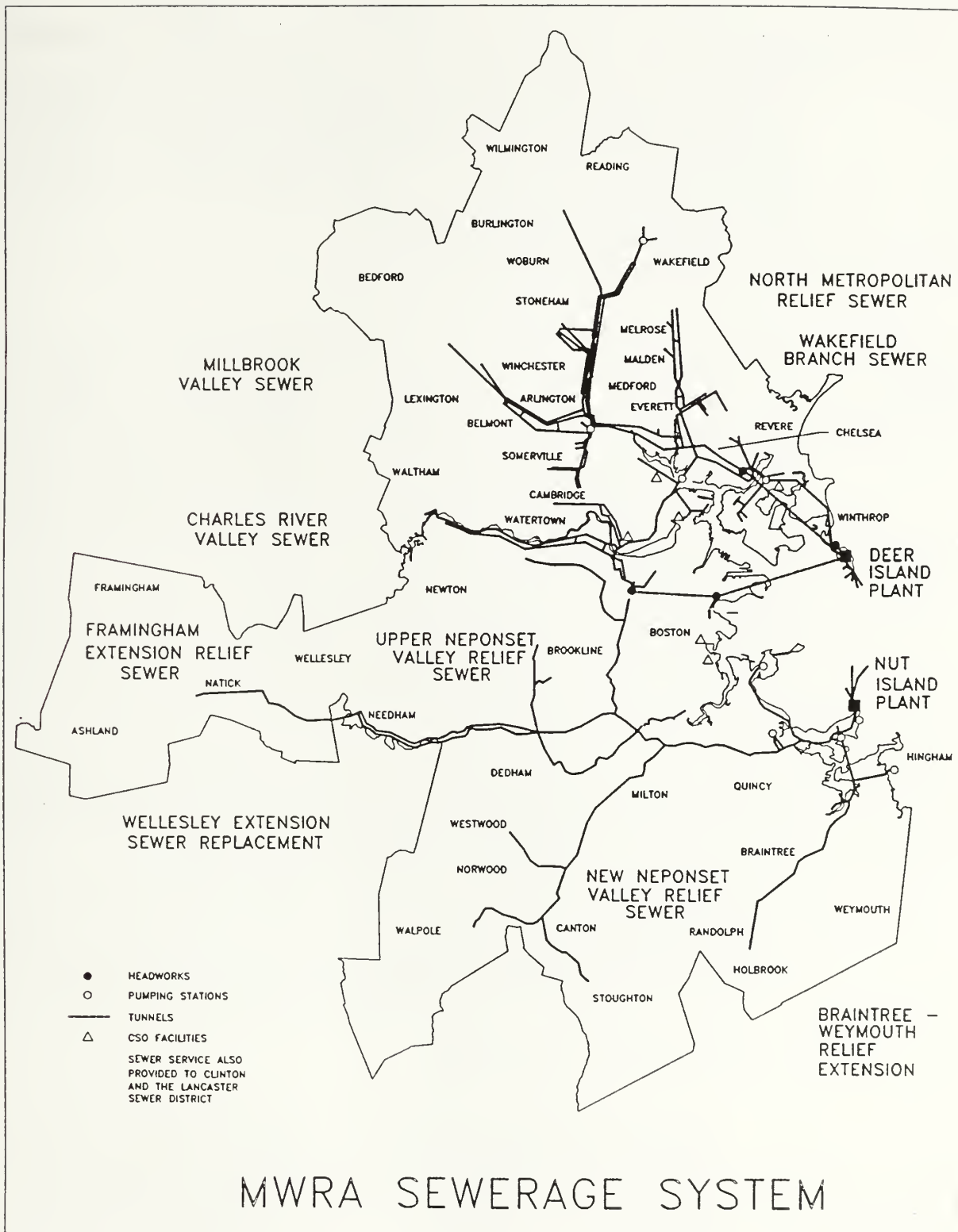
Descriptions of the individual capital projects in each program category follow this summary. Expenditure forecasts and project schedules for the Wastewater improvement program are summarized in the following project narratives, and presented in detail in the FY97 - 99 CIP *Supplement*.

Wastewater Program by Program Category (\$000s)

<u>Program Category</u>	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>	<u>FY97-99 Total</u>	<u>Beyond FY99</u>
Interception & Pumping	\$40,655	\$26,111	\$22,128	\$88,894	\$170,748
Treatment	244,716	187,598	146,187	578,501	49,265
Residuals Management	24,697	15,896	1,814	42,407	675
CSO	9,897	13,162	21,541	44,600	308,216
<u>Other*</u>	<u>(1,818)</u>	<u>(463)</u>	<u>(570)</u>	<u>(2,851)</u>	<u>(3,731)</u>
Total	\$318,147	\$242,304	\$191,100	\$751,551	\$525,173

* Negative numbers indicate positive cash flows from repayment of loan portion of the I/I Program.





1101. Quincy Pump Facilities

Purpose Quincy Pump Facilities (Quincy, Squantum, Hough's Neck) are all beyond their useful lives and prone to failure. Force mains connected to the stations are corroded and maintain a very low velocity resulting in high energy losses due to friction and other flow constraints. New pump stations will be constructed and force mains will be rehabilitated to ensure the continuous pumping of sewage flows to the Nut Island Treatment Plant.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$526	Dec 87	Mar 95
Design/CS/RI/Land Acquisition	\$4,144	Jul 91	Jan 98
Construction/Legal/Hazardous Waste/Public Relations	\$18,628	Jul 89	May 02
Technical Assistance	\$44	Dec 87	Jan 02
TOTAL:	\$23,342		

**Project History
and
Background**

The Quincy Pump Facilities, serving the City of Quincy, include the Quincy Pump Station, Hough's Neck Lift Station, Squantum Pump Station, and associated force mains. Background for each pump station is included below.

- Quincy Pump Station is a 21.5 million gallons per day (mgd) facility in operation since 1906.
- Squantum Pump Station is an eight mgd facility built in the late 1930s.
- Hough's Neck Lift Station is a one mgd facility in service since 1942.

The two existing force mains include:

- Quincy Force Main, comprised of two 3,000 foot force mains. One main, 24 inches in diameter, was built in 1902 and has a remaining useful life of less than five years. The other, 30-inches in diameter, was built in 1923.
 - Squantum Force Main, built in 1972, is 19,000 feet long, and ranges in diameter from 24- to 30-inches.
-

Scope

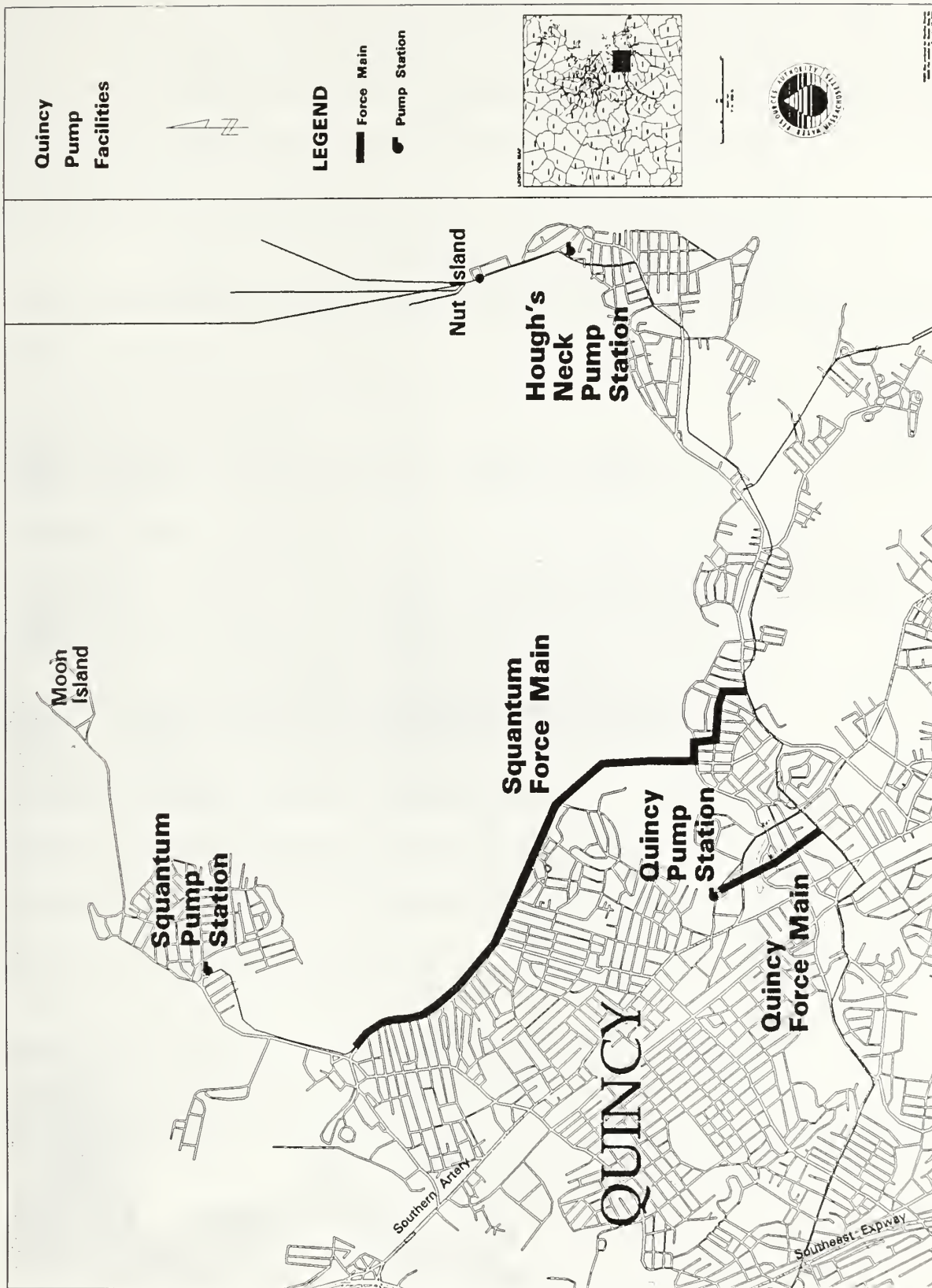
Phase	Scope
Facilities Plan/EIR	Evaluate existing conditions, propose improvements, and assess the impacts of those improvements.
Design/CS - Rehab	Design of the Construction-Rehab phase.
Construction - Rehabilitation	Short term improvements: Installation of a heating unit and a prime mover at Quincy Pump; installation of a comminutor, two four-mgd pumps with AC drives, ships ladders, back-up equipment, and an additional four mgd sewage pump to serve as an emergency back-up at Squantum Pump; electrical upgrade including alarm and generator room improvements.
Land Acquisition	Acquire land for new Squantum Pump Station.
Design/CS/RI 1	Provide design & CS/RI for Construction 1-3, 5, & 6.
Construction 1	Construction of a new eight mgd Squantum Pump Station.
Construction 2	Construction of a new 26 mgd Quincy Pump Station.
Construction 3	Construction of a new 1.5 mgd Hough's Neck Pump Station.
Construction 4	Rehabilitation of 4,576 linear feet of the Squantum Force Main through installation of a cured-in-place resin-impregnated flexible liner.
Construction 5	Rehabilitation of the remaining 14,400 linear feet of the Squantum Force Main by sliplining with 20-inch polyethylene liner pipe.
Construction 6	Rehabilitation of the existing 30-inch Quincy Force Main and abandonment of the existing 24-inch Quincy Force Main.
Technical Assistance	Design services for Squantum Force Main early rehabilitation and Construction 4.
Legal	Legal expenses, as required, associated with resolving construction or design issues or claims.
Public Relations	Expenses associated with resolving technical issues with the community and project abutters arising from project implementation.
Hazardous Waste	Expenses associated with disposal of hazardous waste identified during construction.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction 6	This phase has been reduced in scope because further engineering evaluations have shown that rehabilitation of the existing 30-inch force main will provide sufficient capacity and reliability, and that replacement is not necessary.
Construction 5	This phase has been reduced in scope because further engineering evaluations have shown that only the 30-inch ductile iron portion of the force main requires rehabilitation. The rehab method chosen has been changed from sliplining to application a cementitious lining.
Construction-Rehab	Delete Hough's Neck interim work.

CEB Impact

CEB line item	FY98	FY99	FY2000	Description
Labor	\$0	\$0	\$0	Staff reduction from nine to three at the new Quincy Pump Station due to the use of modern equipment and new pumping configuration.
Chemicals	\$0	\$0	\$0	Carbon absorption odor control system will be installed at the new Quincy Pump Stations. Operating cost is not included in the analysis period because the initial filling of the activated carbon is funded through the CIP. Beyond FY03, estimates will include additional funds for chemical replenishment.
Utilities	\$0	\$5,141	\$1,714	All three pump stations will be electrically operated.
Maintenance	\$0	\$9,750	\$1,000	Increased use of instrumentation controls requires extensive preventive maintenance.
Other	\$0	\$10,300	\$3,100	One time start-up expenses such as computers and office furniture are required.
TOTAL:	\$0	\$25,191	\$5,814	



1102. Braintree-Weymouth Relief Facilities

Purpose Construction of new relief facilities and the resulting reduction in infiltration and inflow will provide capacity for peak sewage flow in Braintree, Hingham, Holbrook, Randolph, Weymouth, and sections of Quincy. This project will reduce surcharging in Braintree and Weymouth, and will end frequent sewage overflows into the Weymouth-Fore River.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study/Sediment Tests	\$2,520	Oct 81	Apr 96
*Design/CS/RI/Land Acquisition	\$24,623	Jan 91	May 00
Construction/Legal/Public Relations/Hazardous Waste	\$121,091	Jan 92	Jun 02
Technical Assistance	\$101	Nov 84	May 02
TOTAL:	\$148,335		

* Budget includes the costs associated with a dual track design approach for determining the best solution for transporting effluent from the new pump station to the Nut Island shaft. The dual track will concurrently develop designs for both a deep rock tunnel and marine pipeline alternative until the feasibility and cost effectiveness of a marine pipeline can be verified. The MWRA does not expect to incur the total budgeted cost for design of both alternatives and, in fact, anticipates the total design cost to be approximately \$10 million.

**Project History
and
Background** The Braintree Weymouth Interceptor System and Pump Station serve Braintree, Hingham, Holbrook, Randolph, Weymouth, and sections of Quincy. Population increases in these communities have resulted in a sewerage system that cannot support the volume of sewage received. Sewage overflows are severe and frequent along the Weymouth-Fore River.

Interim rehabilitation work is required to ensure continued operation of the existing Braintree-Weymouth pump station during the long-term design and construction period. Rehabilitative work accomplished to date includes installation of a motorized influent gate and a mechanical bar screen, as well as heating improvements.

The MWRA is proceeding with a dual track design approach for part of this project. Planning and design of a marine pipeline from the new pump station (Construction 2) to the Nut Island shaft is being pursued on a dual track with design of a deep rock tunnel (Construction 1), since it may be more cost-effective.

Scope

Phase	Scope
Draft Facility Plan	Prepare Facilities Plan for work associated with the Braintree-Weymouth project.
Draft EIR	Prepare EIR for work associated with the Braintree-Weymouth project.
Final EIR /Facility Plan	Planning and EIR work associated with the revised Braintree-Weymouth project.
Geotechnical-Land	Geotechnical investigation of areas associated with construction on land.
Geotechnical-Marine	Geotechnical investigation of areas associated with construction in river and harbor.
Design 1/CS/RI - Tunnel & IPS	Design of Construction contracts 1 & 2. Includes completion of design modifications for sludge pumps and valve chamber.
Design 3/CS/RI Marine Pipeline	Design of marine pipeline alternative.
Sediment Tests	Assist with evaluation of marine pipeline option.
Design 2/CS/RI - Surface	Design of Construction contracts 3 through 8.
Land Acquisition	Purchase pump station land from Boston Edison; acquire easements for relief sewer from Braintree and Weymouth homeowners, and other land owners.
Construction 1	Construction of a 2.9 mile, 12-foot diameter Braintree-Weymouth Tunnel beginning at the Nut Island Shaft and ending at the Fore River Staging Area. Two 14-inch sludge pipelines will convey Deer Island sludge from the Inter-Island tunnel to the pelletizer plant. 0.4 miles of twin 14-inch filtrate pipelines will convey filtrate from the pelletizing plant to the North Weymouth pumping station. 2.5 miles of 48-inch force main will carry relief flows and filtrate to the Inter-Island Tunnel.

Construction 2	Construction of a 60 mgd pumping station/headworks in North Weymouth. Also includes modifications to the sludge pumping facilities at Deer Island and the filtrate pumping facilities at Fore River.
Construction 3	Construction of 2,000 linear feet of 60-inch gravity sewer running from the North Weymouth pump station and along the Boston Edison Edgar Station property.
Construction 4	Installation of a 48-inch, 1,800 feet long twin siphon from the Edison site across the Fore River to E. Braintree.
Construction 5	Construction of 1,000 linear feet of 60-inch gravity sewer along the E. Braintree shoreline to a new 42-inch, 800 linear feet siphon between E. Braintree and Weymouth and then extending 2,100 linear feet along the shore of Idlewell to Mill Cove.
Construction 6	Construction of a new 13 mgd Braintree-Weymouth pump station that will handle approximately 19% of existing flow.
Construction 7	Downsizing the existing 1,700 linear feet of twin 54-inch Fore River Siphon by inserting a twin 24-inch siphon within the existing siphon from Germantown to N. Weymouth.
Construction 8	Downsizing 2,800 linear feet of 60-inch N. Weymouth sewer by inserting a 42-inch sewer within the existing sewer.
Design-Rehab	Design of Construction-Rehab phase.
Constr-Rehab	Interim rehabilitation of the existing Braintree-Weymouth Pump Station that includes relocating an existing A.C. generator with D.C. rectifier and new vacuum pumps.
Legal	Legal expenses associated with resolving construction or design issues or claims.
Public Relations	Expenses associated with resolving technical issues with the community and project abutters arising from project implementation issues.
Hazardous Waste	Expenses associated with disposal of hazardous waste identified during construction.
Technical Assistance	Provided for the installation of gates and screens.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Design 3/CS/RI Marine Pipeline	New contract for FY97-99 for design of marine pipeline alternative.
Design 1	Additional work to complete design modifications for sludge pumps and valve chambers.
Design-Rehab	Eliminate construction services from design package.
Construction-Rehab	Transport Department will install existing generators instead of buying new emergency generators.

CEB Impact

CEB line item	FY02	FY03	Description
Labor	(\$82,202)	(\$148,229)	Staff reduction from ten to six due to the transition from manual to automatic pumps.
Chemicals	\$76,720	\$38,360	West scrubber odor control system will be installed at B-W Intermediate Pump Station. Carbon absorption odor control system will be installed at the B-W Relief Pump Station.
Utilities	\$345,405	\$182,922	Both pump stations will be electrically operated.
Maintenance	(\$41,000)	\$46,987	Increased use of instrumentation controls requires extensive maintenance.
Other	\$236,274	\$59,069	One time start-up expenses such as computers and office furniture are required at the new pumping facilities.
TOTAL:	\$535,197	\$179,109	

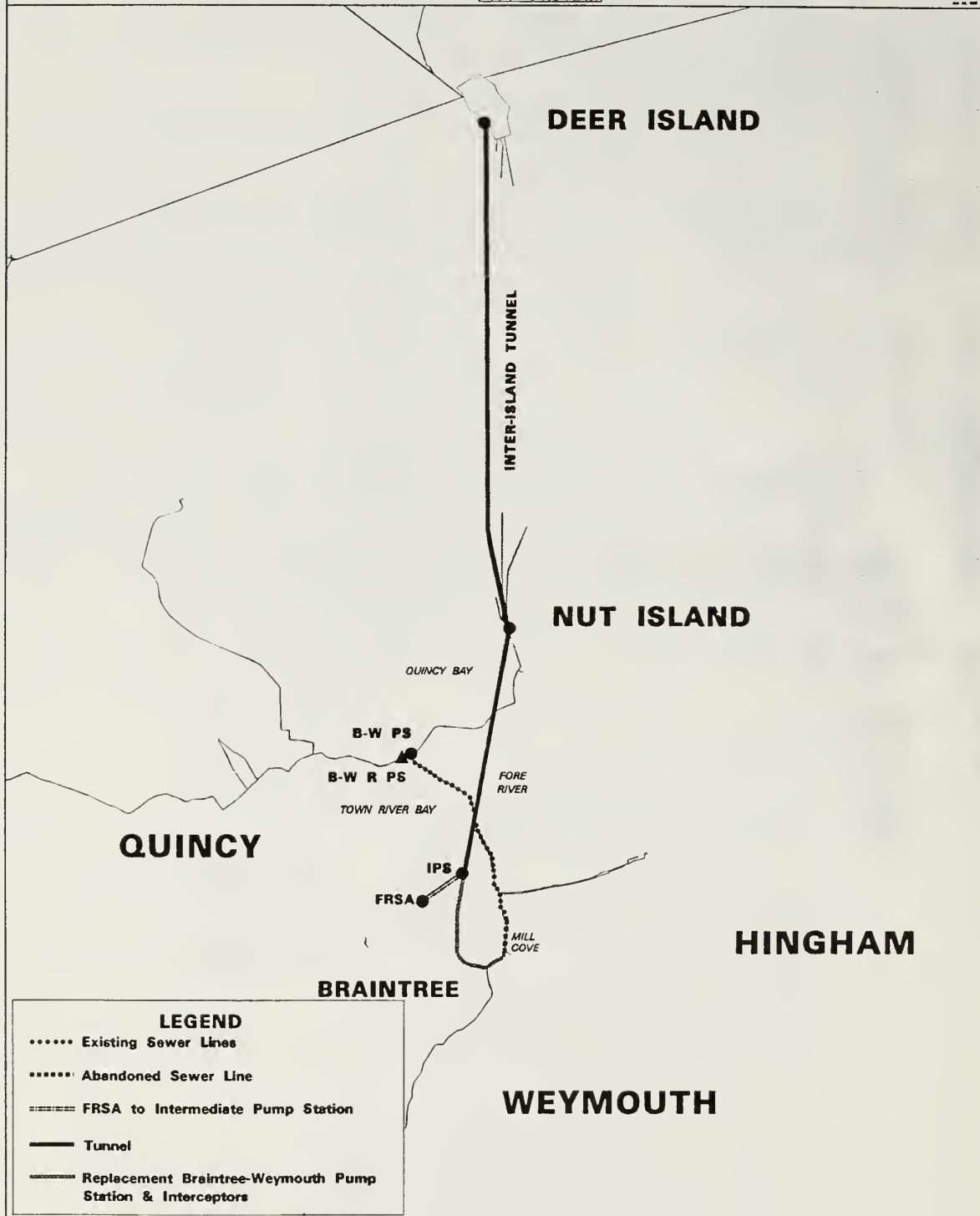
Braintree-Weymouth Relief Facilities



1" = 2263 ft.



1988 Not valid for 1992 Publication
May 16, 1988



1103. New Neponset Valley Relief Sewer

Purpose

The structural and hydraulic deficiencies of the New Neponset Valley Interceptor Sewer System have led to surcharging and sewage overflows which, combined with other pollution sources, threaten the Neponset River Watershed, the water supply for Canton and the Dedham/Westwood Water Authority. Construction of new relief facilities is needed to mitigate current problems and to accommodate the anticipated increase in demand caused by population growth in the service area.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study/Environ. Consultant	\$2,488	Apr 83	Jul 97
Design/CS/RI/Land Acquisition	\$5,240	Feb 89	Dec 94
Construction	\$23,733	Sep 93	Sep 96
Technical Assistance	\$189	Apr 88	Mar 96
TOTAL:	\$31,650		

Project History and Background

The New Neponset Interceptor Sewer System consists of the New Neponset Valley Sewer, the Westwood Extension Sewer, the Walpole Extension Sewer, the Stoughton Extension Sewer, and the Dedham Branch Sewer. The system serves Walpole, Stoughton, Canton, Norwood, Westwood, and parts of Dedham, Hyde Park, and Milton. Structural deficiencies within the system include deteriorated manhole risers, improper castings, structural damage due to superimposed loadings, and segments that require cleaning. Hydraulic problems include a six mgd deficiency in the downstream segment and approximately 22 mgd in several upstream segments. Such inadequacies occur during heavy rainfall and cause surcharging and sewage overflow to ground surfaces and adjacent water bodies.

The sewer population is expected to increase from 81,000 to 136,600 by 2002 primarily due to the expected conversion from septic tanks to sewer service in the towns of Canton, Stoughton, Walpole, and Westwood.

Construction of new relief facilities commenced in 1993. The pump station began operating in March 1996.

Scope

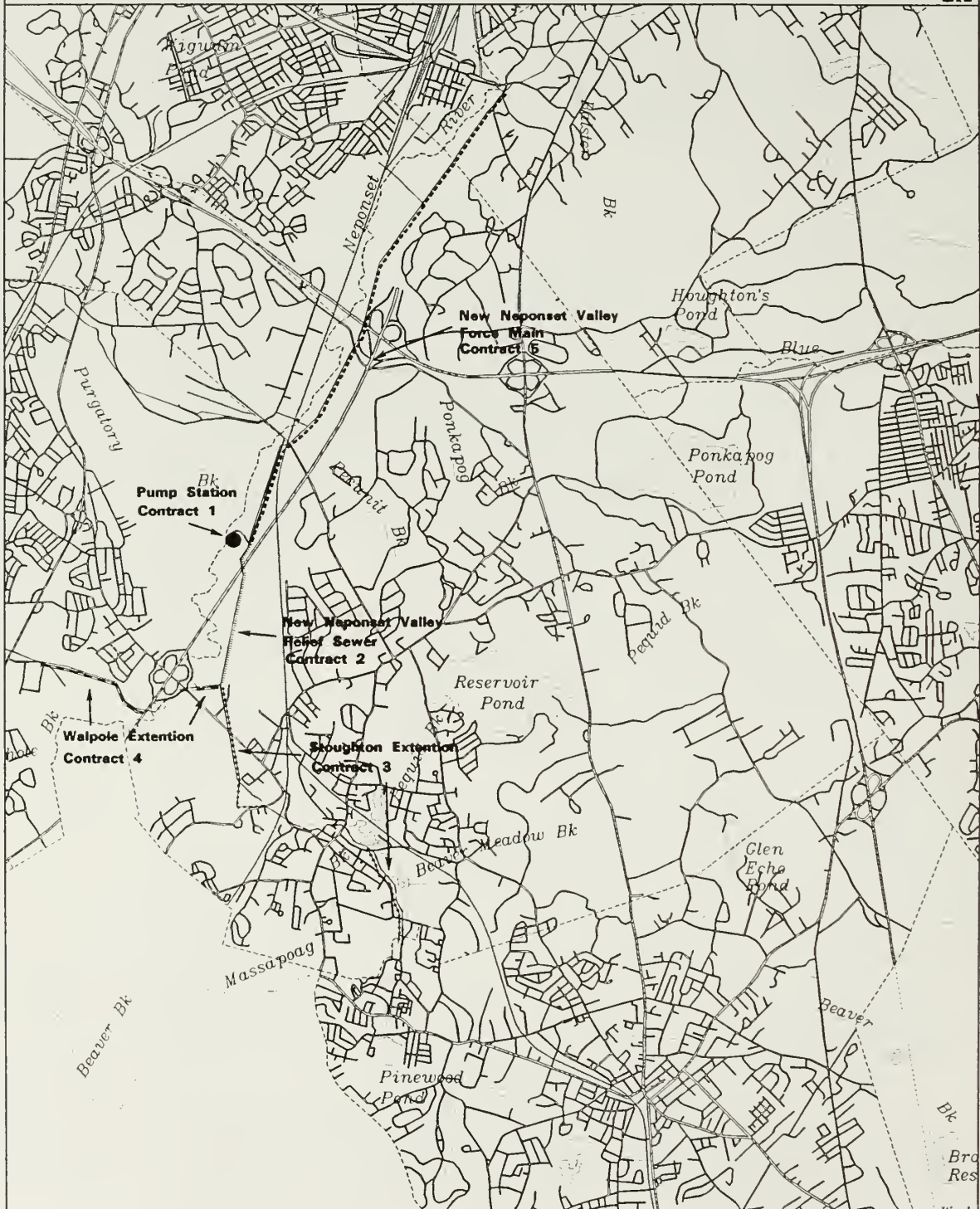
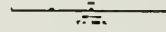
Phase	Scope
Facilities Plan	Evaluate existing conditions, propose improvements, and assess the impacts of those improvements.
EIR/Supp. Facility Plan	Further evaluation required and performed by MEPA.
Design/CS/RI	Design and CS/RI for Construction contracts 1-5.
Land Acquisition	Land taking, easements, and litigation to allow for construction phases to occur.
Consultant-Milton & Canton	Engagement of an environmental monitor for the Milton and Canton Conservation Commissions to oversee the wetlands related work performed within the respective jurisdictions. Services continue through November of 1997.
Construction 1	Construction of a 46 mgd pump station and 2,850 linear feet of 48-inch force main.
Construction 2	Installation of 5,900 linear feet of 54-inch gravity sewer for the New Neponset Valley Relief Sewer.
Construction 3	Installation of 5,330 linear feet of 36-inch gravity sewer for the downstream section and 4,055 linear feet of 24- to 30-inch gravity sewer for the upstream section of the Stoughton Extension Sewer.
Construction 4	Installation of 6,920 linear feet of 30- to 48-inch gravity sewer for the Walpole Extension Sewer.
Construction 5	Installation of the remaining 18,544 linear feet of 48-inch force main for the New Neponset Valley Relief System.
Study Dedham Street	Study to determine if a section of settled sewer line was subsequently repaired in the early 1960s and whether it may have contributed to groundwater contamination.
Power Line	Installation of power and telephone utilities.
Technical Assistance	On-going environmental assistance contracts (wetlands restoration and revegetation experts, experts on endangered species, etc.)

Changes in None.
Scope
Since FY96-98
CIP

CEB Impact None.

New Neponset Valley Relief Sewer Project

Massachusetts Water Resources Authority



1103. New Neponset Valley Relief Sewer
Interception and Pumping

1104. Upper Neponset Valley Relief Sewer

Purpose

The Upper Neponset Valley Sewer is hydraulically deficient within Sections 26 through 29, resulting in frequent community system back-ups and interceptor overflows to adjacent residential areas and water bodies in Brookline, Boston, Newton, and Dedham. The construction of a new interceptor in three sections will reduce chronic wastewater overflows, thereby improving water quality.

As part of the System Master Plan Interceptors project, MWRA is evaluating the downstream impacts of the project. Pending completion of the evaluation in FY99, the MWRA will commence the planning and design of the New Upper Neponset Valley Relief Sewer.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Design/CS/RI	\$2,998	Sep 95	Apr 04

Project History and Background

The Upper Neponset Valley Sewer (UNVS), constructed between 1896 and 1902, extends approximately four miles through the towns of West Roxbury and Newton, and receives wastewater from West Roxbury, Brookline, Newton, and a small portion of Dedham.

The size and slope of the sewer, both of which affect capacity, change dramatically in some areas, specifically in Sections 26 through 29. Section 29 ranges from a 12-inch circular pipe upstream to a 26-inch oblong pipe downstream. The sewer expands to a 45-inch by 48.5-inch oblong shape at the furthest downstream portion, Section 26. The average daily flow is 7.21 mgd with a peak flow of 23.6 mgd. The hydraulic capacity of these sections ranges from a low of 5.8 mgd to a high of 11.65 mgd with several capacity constraints in between. The difference between actual flows and the hydraulic capacity results in serious overflows and surcharges during periods of heavy rainfall.

The 1984 Wellesley Extension Sewer Facilities Plan/Environmental Impact Document (EID) estimated that the UNVS overflowed an average of six to ten times per year with occurrences lasting as long as ten days.

In 1980, the Department of Environmental Protection performed sampling and testing in the portion of the Charles River near the UNVS and found contamination. The report also indicated that the peak infiltration/inflow (I/I) to these sections of the UNVS can reach 16.09 mgd.

The Facilities Plan/EID indicated that the installation of a new 10,800 foot interceptor is the most cost effective solution. With the increased capacity of the new interceptor ranging from 15.65 to 25.7 mgd, chronic wastewater overflows will be reduced, thereby improving water quality.

Scope

Phase	Scope
Planning/Design/CS/RI	Evaluate alternatives and recommend installation of a new 10,800 foot interceptor or the most cost-effective solution. Design, resident inspection, and construction services of Construction phase.

Changes in Scope Since FY96-98 CIP

Phase	Change
Planning/Des/CS/RI	Combined into one phase for the FY97-99 CIP.
Construction/ Land Acquisition/ Legal/Public Relations/ Hazardous Waste	Phases eliminated pending evaluation of the downstream impacts of this project in FY99. This evaluation will be completed as part of the System Master Plan Interceptors project.

CEB Impact None.

1105. Wellesley Extension Sewer Replacement

Purpose

The Wellesley Extension Sewer System is unable to convey all flows resulting in surcharging and overflows into the Charles River in parts of Dedham, Needham, Wellesley, Dover, and Natick, and endangering two water supplies: the Needham town wells and the Elm Bank Aquifer. Construction of a replacement sewer will alleviate capacity constraints, improve the water quality of the Charles River, protect the aquifers, and reduce back-ups in Needham and Dedham.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$734	Oct 81	Jun 96
Design/CS/RI/Land Acquisition	\$12,671	Dec 84	Mar 00
Construction/Engineering and Inspection Consultant/Public Relations/Legal	\$58,507	Jun 89	Mar 00
Technical Assistance	\$193	Jun 89	Sep 95
TOTAL:	\$72,105		

Project History and Background

The Wellesley Extension Sewer System is comprised of the Wellesley Extension Sewer, constructed between 1916 and 1921, and the Wellesley Extension Relief Sewer. Both sewers are situated along the Charles River and serve Needham, most of Wellesley, and part of Dedham. The Framingham Extension Sewer is also tributary to the Wellesley Extension Sewer System.

Seven of the eight construction contracts have been completed.

Scope

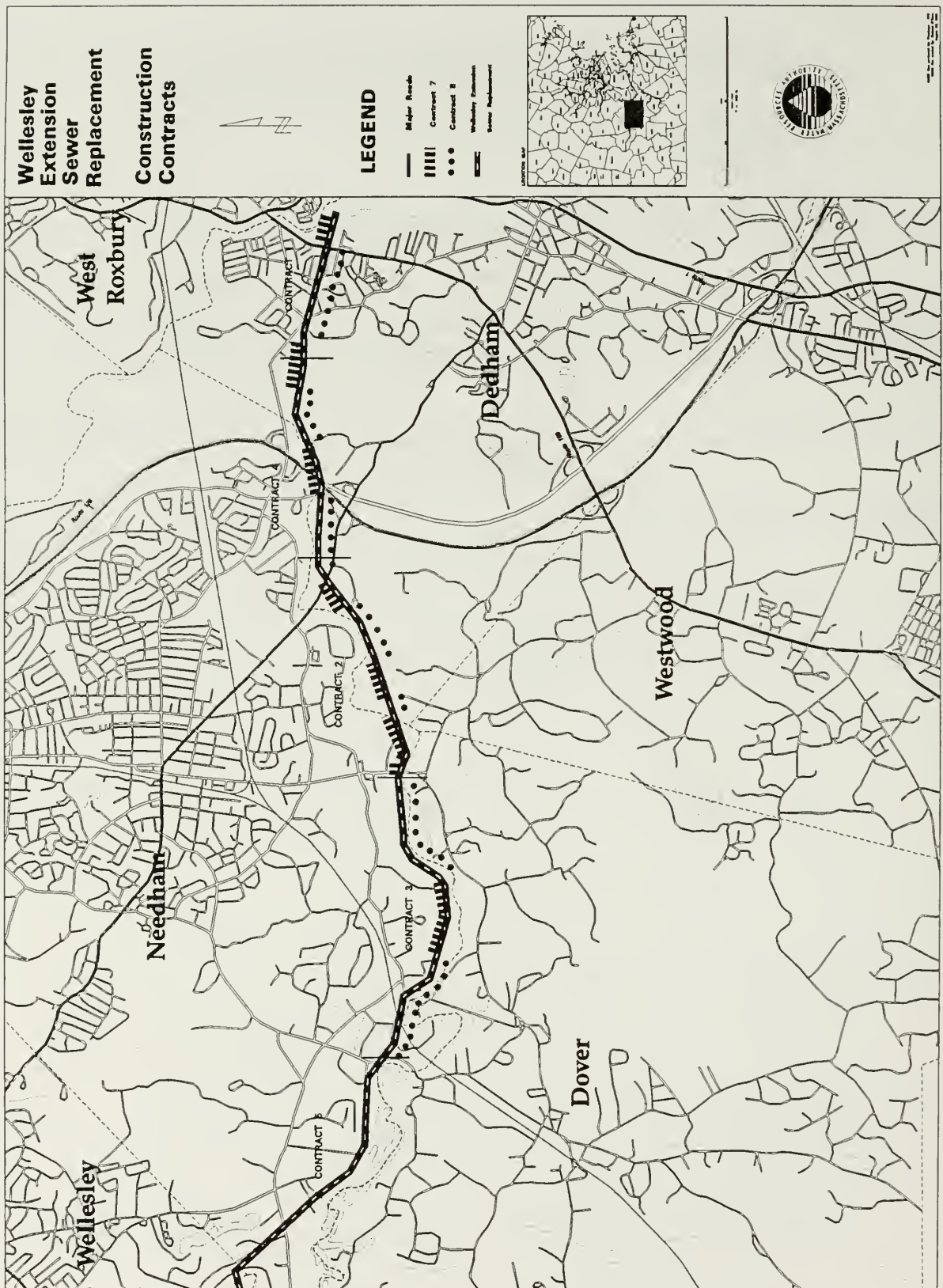
Phase	Scope
Study	Evaluate existing conditions, propose improvements, and evaluate impacts of those improvements.
Design/EIR/CS/RI	Perform all design and environmental studies and provide construction services/resident inspection during the construction phase.
Land Acquisition	Land taking, easements, and litigation to facilitate construction phases.
Consultant-Needham, Dover, Dedham	Engagement of consultants for the Needham, Dover, and Dedham Conservation Commissions to oversee wetlands related work performed within their respective jurisdictions.
Construction 1	Installation of 4,850 linear feet of 60-inch interceptor in Dedham, including a 3,040 linear foot tunnel, and abandonment of 300 linear feet of the Wellesley Extension Sewer (WES).
Construction 2	Installation of 6,720 linear feet of 54- to 60-inch interceptor located in Dedham and Needham, including a 230 linear foot river crossing and a 215 linear foot brook crossing.
Construction 3	Installation of 10,300 linear feet of 60-inch interceptor in Needham, including a 1,200 linear foot tunnel.
Construction 4	Installation of 6,170 linear feet of 54- to 60-inch interceptor in Dedham including a 160 linear foot pipe crossing the Charles River, a 450 linear foot Route 128 crossing, and the abandonment of 2,900 linear feet of the WES.
Construction 5	Installation of 9,500 linear feet of 60-inch interceptor in Needham, Wellesley, and Dover, including a 120 linear foot river crossing.
Construction 6	Installation of 7,540 linear feet of eight to 15-inch local sewers in Dedham and Needham, sliplining 1,600 linear feet, and abandoning 9,990 linear feet of the WES.
Construction 7	Rehabilitation of 37,217 linear feet of the Wellesley Extension Relief Sewer, relining of 8,850 linear feet of the Wellesley Extension Sewer Replacement (WESR), and abandoning 17,250 linear feet of the WES.
Construction 8	Relining of 19,100 linear feet of WESR.
Engineering and Inspection Consultant	Provides consulting services for design and inspection for protective coating systems to be installed in the North Metropolitan Trunk Sewer Rehabilitation Phase II and the Wellesley Extension Sewer Replacement Construction 8.
Legal	Legal expenses associated with resolving construction and design issues or claims.

Public Relations	Expenses associated with resolving technical issues with the community and project abutters arising from project implementation.
Technical Assistance	Preliminary assessment for contamination associated with Construction 1.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction 7	Reline additional 978 linear feet of the WERS.

CEB Impact None.



1105. Wellesley Extension Replacement Sewer
Interception and Pumping

1106. Framingham Extension Relief Sewer

Purpose

The Framingham Extension Sewer has inadequate capacity to serve current and projected demand, resulting in surcharging and discharging of sewage into local water bodies such as the Charles River and Beaverdam Brook. The installation of a new force main, construction of a new pump station, and rehabilitation of more than 23,000 linear feet of existing pipe will provide sufficient capacity to meet peak flows and reduce overflows.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$1,402	Feb 90	Jul 90
Design/CS/RI/Land Acquisition	\$8,478	Jul 90	Sep 99
Construction	\$42,012	Jun 94	Oct 00
Technical Assistance	\$147	Feb 90	May 00
TOTAL:	\$52,039		

Project History and Background

The Framingham Extension Sewer, constructed in the mid 1950s, is approximately 31,150 linear feet in length, with a diameter varying between 42- and 54-inches. The existing sewer receives wastewater from the towns of Framingham, Ashland, and Natick and transports these flows to the Wellesley Extension Sewer for eventual conveyance to the Nut Island Treatment Plant. The current peak wet weather flow is approximately 42.75 mgd.

The current population and expected growth, as well as the aging of the pipes, have led to deterioration and excessive discharging of the sewer system.

The new sewer system is designed for a peak flow of 43.65 mgd.

Scope

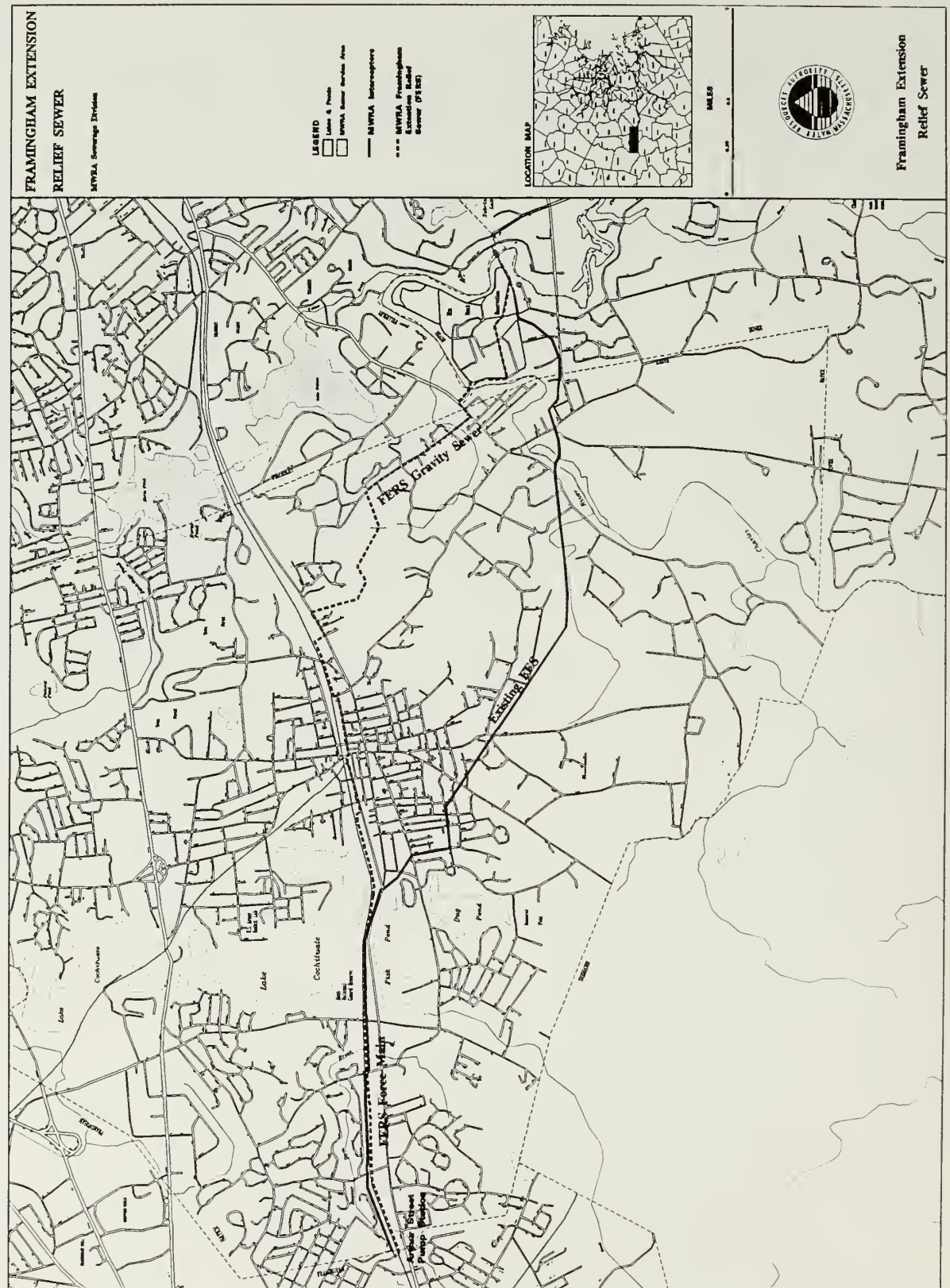
Phase	Scope
Facility Plan Update/EIR	Evaluate existing conditions, propose improvements, and evaluate the impacts of those improvements.
Land Acquisition	Land taking, easements, and litigation (if necessary) to facilitate construction.
Design/CS/RI	Design and construction services for Construction phases.
Construction 1	Installation of 25,000 linear feet of 36-inch force main in Framingham and Natick.
Construction 2	Installation of 11,000 linear feet of 36-to 60-inch gravity sewer in Natick, Wellesley, and Dover.
Construction 3	Construction of a 21 mgd pump station in Framingham.
Construction 4	Rehabilitation of 7,439 linear feet of 42- to 48-inch sewer in Framingham and Natick.
Construction 5	Rehabilitation of 15,830 feet of sewer in Natick and Dover.
Technical Assistance	Technical assistance as needed in support of all construction contracts.

Changes in Scope Since FY96-98 CIP

Phase	Change
Design/CS/RI	Includes alternative option of jacking a portion of the gravity sewer, and additional conditions for restoration of the Charles River banks.
Construction 2	Contract was amended to include microtunneling under a 150-year old oak tree on Elm Bank.

CEB Impact

CEB Line Item	FY98	FY99	FY00	Description
Labor	\$4,078	\$44,857	\$0	Two part-time electric operators to disinfect the plant and flush the force main.
Chemicals	\$15,123	\$166,355	\$25,388	Carbon absorption odor control system will be installed at the new Framingham Pump Station. Activated carbon will be replaced every other year. In addition, chemicals are required for hydrogen sulfide control along the Framingham Extension Sewer.
Utilities	\$28,872	\$317,588	\$0	The new pump station is electrically operated.
Maintenance	\$2,917	\$37,500	\$59,583	Instrumentation controls require extensive preventive maintenance.
Other	\$21,300	(\$5,702)	\$0	One time start-up expenses such as computers and office furniture are required at the new pumping stations.
TOTAL:	\$72,290	\$560,598	\$84,971	



1107. Cummingsville Replacement Sewer

Purpose

Capacity deficiencies in the MWRA system may be associated with overflows of local sewers upstream from the Cummingsville Branch System. These overflows are responsible for degradation of local drinking water supplies at Horn Pond in Woburn, and possibly in Burlington. In addition, sewer moratoriums are in effect in both communities. Construction of a replacement sewer and rehabilitation of existing sewers will provide the capacity to ensure adequate and reliable wastewater service for upstream communities.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$605	Jun 92	Jul 95
Design/CS/RI/Land Acquisition	\$609	Aug 96	May 00
Construction	\$2,982	Jun 02	May 02
TOTAL:	\$4,196		

Project History and Background

The Cummingsville Branch Sewer System is located in the Town of Winchester and receives wastewater from sections of Winchester and Woburn and all of Burlington. The Cummingsville Branch Sewer System consists of the Cummingsville Branch Sewer, constructed around 1894, and the Cummingsville Branch Relief Sewer, constructed in 1952.

The existing system consists of 9,475 linear feet of 15- to 30-inch pipeline and has a flow capacity of 13 mgd. The 1975 Eastern Massachusetts Metropolitan Study recommended relief of the Cummingsville Branch Sewers to meet wastewater demand.

In 1988, the MWRA informed local and state officials that the Cummingsville Branch Sewers would be on a priority list in any future sewer planning and design efforts.

In 1992, the MWRA commenced facilities planning to study the adequacy of the system. Analysis of existing capacity and future expected flows resulted in identification of a system deficiency of approximately eight mgd. In addition internal television inspection of the existing sewers revealed cracks, infiltration, spalling, poor joint conditions, and root intrusion which compromise the structural and hydraulic integrity of these lines. Extensive evaluation identified the replacement of the Section 47 sewer with a new 36-inch gravity sewer as the preferred alternative. The replacement presents the fewest long-term environmental impacts, is the least expensive to construct and maintain, and renders unnecessary the extensive rehabilitation that would be required for this 100-year old sewer to remain in service.

The project also includes rehabilitation of the existing Section 86 and a small portion of Section 87 sewers to ensure their continued service and will be performed within the existing pipes without the need for excavation.

In November 1994, the MWRA received notice from the Secretary of Environmental Affairs that an Environmental Impact Report (EIR) would not be required for construction of the new sewer.

Scope

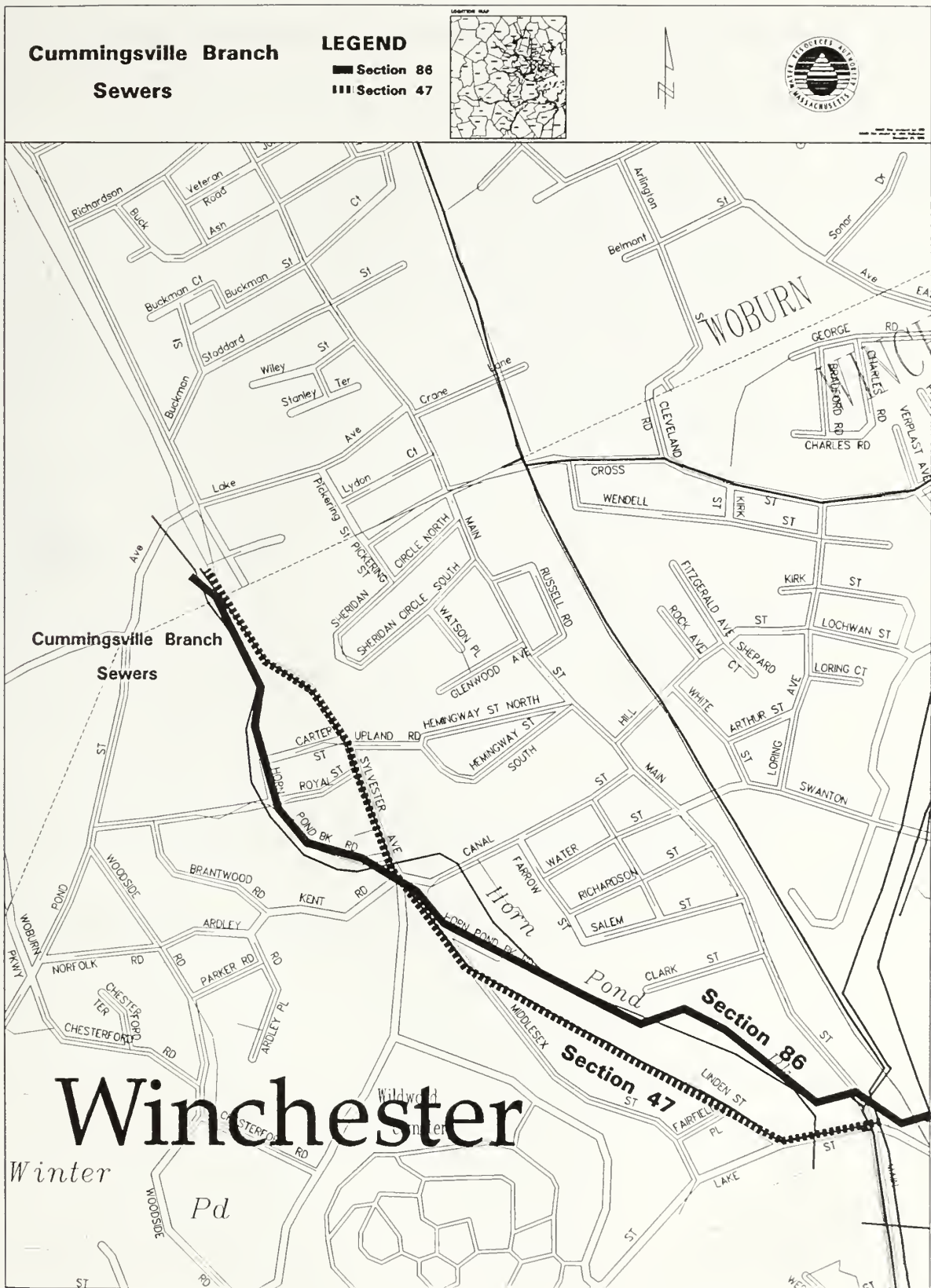
Phase	Scope
Facilities Plan/EIR	Evaluate potential adverse impacts associated with additional flows downstream and recommend improvements to the system.
Design/CS/RI	Design for construction phase.
Land Acquisition	Land taking, easements, and litigation (if necessary) to facilitate construction.
Construction (new sewer) and Rehab of existing sewers	Replacement of the Section 47 sewer with a new 36-inch gravity line. Cleaning and repair of the existing Section 86 sewer, along with a small portion of Section 47 which will remain active to carry local flows.

Changes in Scope Since FY96-98 CIP

None.

CEB Impacts

None.



1108. Alewife Brook Parkway Pump Station Rehabilitation

Purpose The eight mgd Alewife Brook Parkway Pump Station has experienced frequent failures of its original electric gear motor units and screens, equipment required to operate the main sewage pumps and to remove large debris from the waste stream. Repairs are time consuming and costly because the motor units are 30 years old and require fabrication of replacement parts. In addition, the pump station has interconnected rooms which allow explosive and hazardous gases from the sewer to fill the entire pump station. Equipment replacement, a new building addition, and wetwell modifications will bring the station up to existing code requirements and make the screen room an explosion-proof area.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Construction	\$1,355	Jun 91	Apr 95
Technical Assistance	\$132	Jun 91	May 95
TOTAL:	\$1,487		

**Project
History and
Background**

The Alewife Brook Parkway Pump Station is an eight mgd facility serving Medford, Somerville, Belmont, Cambridge, and Arlington.

The construction phase of the project has been substantially completed.

Scope

Phase	Scope
Construction	Replacement of three 100 horsepower and one 50 horsepower gear motor units. The replacement included the electric motor and integral gear reduction unit for each of the four pumps.
Rehab Construction	Replacement of new mechanical screens, installation of a 400 kilowatt emergency power generator to provide standby power, and the addition of a locker room.
Technical Assistance	Provision of technical assistance to support construction.

Changes in Scope Since FY96-98 CIP None.

CEB Impacts None.

1109. North Metropolitan Trunk Sewer Rehab (Phase II)

Purpose To rehabilitate 19,700 linear feet of the 100 year old North Metropolitan Trunk Sewer (NMTS), which is suffering from internal deterioration. This rehabilitation will ensure that flows from the Caruso Pump Station in East Boston can be reliably transported to the Deer Island Treatment Plant.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design	\$0	Dec 92	Aug 95
Construction	\$20,195	Jul 96	Aug 98
TOTAL:	\$20,195		

**Project
History and
Background**

The NMTS, constructed in the 1890s, is a nine foot diameter, 25,000 linear foot brick sewer connecting the Ignatius Caruso Pumping Station in East Boston to the Deer Island Sewage Treatment Plant. The NMTS conveys dry weather sewage flows from East Boston, Chelsea, Revere, and Winthrop as well as overflows from the Chelsea Creek Headworks which are diverted to the pumping station during wet weather conditions.

Rehabilitation of portions of the NMTS was to be completed under a separate construction contract associated with the MWRA East Boston Pumping Station Facilities project. During construction-related internal inspections of the NMTS for this contract, it became apparent that the repair method for the specified segments of pipe was insufficient and that additional areas required rehabilitation. The areas, approximately 3,400 linear feet, suffering from the most critical structural damage and in need of emergency repair were rehabilitated under the East Boston Pumping Station Rehabilitation project.

The MWRA will rehabilitate the remaining 19,700 linear feet of the NMTS under this project.

Scope

Phase	Scope
Design	In-house design of construction phase.
Construction	360 degree rehabilitation of 19,700 linear feet of the NMTS. Rehabilitation includes cleaning the sewer, placement of shotcrete with wire mesh, application of an epoxy lining system in manholes only, sealing leaks with grout, and disposing of approximately 1,000 cubic yards of sediment and debris.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction	Change in lining from epoxy coating to silica fume shotcrete in horizontal sections. Epoxy coating added in vertical chambers.

CEB Impact None.

1110. Siphon Chamber and Diversion Structure Rehabilitation

Purpose Hydraulic flows through many siphon chambers and diversion structures throughout the MWRA sewage collection system are below design capacities. The poor flow conditions, caused by irregular maintenance due to the inaccessibility of many structures, contribute to significant surcharges and overflows. The detention time of wastewater at many structures also contributes to serious odor problems. A study is underway to rehabilitate these structures to permit greater accessibility and provide regular maintenance in order to alleviate the above mentioned problems.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning	\$661	Jan 96	Dec 97
Land Acquisition	\$10	Mar 98	Jun 99
TOTAL:	\$671		

**Project History
and
Background**

Siphon chambers are structures located at the upstream and downstream ends of depressed sewers. Depressed sewers are constructed to avoid obstructions in sewer alignments such as rivers and subsurface utilities. The upstream siphon chamber allows attainment of proper water elevation so that the depressed sewer flows under pressure. The downstream chamber provides transition between the depressed sewer and the downstream gravity sewer.

Diversion structures are structures at which flows from sewers are redirected to converge with, or receive flows from, other sewers.

There are 92 siphon chambers and 111 connecting structures located throughout the North and South Collection systems. Of this total, 83 siphon chambers and 63 connecting structures have been identified for inclusion in the study phase of this project.

The project will initially consist of a facilities planning report. Construction costs will be estimated during the facilities planning.

Scope

Phase	Scope
Planning	Identification of methods to improve accessibility, structural inspections of the siphon chambers and diversion structures, and recommendations for rehabilitation.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Land Acquisition	New phase for FY97-99 CIP. Phase will address costs related to acquiring easements for construction activities.

CEB Impact None.

1111. Wastewater Metering System Upgrade

Purpose

The MWRA must ensure that the community wastewater flow meter data used to calculate wholesale sewer charges is accurate, reliable, and defensible. Because the metering system was designed to allow for continual upgrade, existing meters may be relocated and additional ones may be added as needed. To ensure that at least 85% of flow in each community is metered, the Authority will add meters as needed in communities with less than 85% coverage, and replace some manhole meters with equipment at local pump stations.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Design	\$10	Oct 94	Sep 96
Construction	\$490	Apr 96	Jun 97
TOTAL:	\$500		

Project History and Background

The MWRA's final phase of the permanent wastewater metering system, completed in January 1994, consists of 212 meters operated and maintained by MWRA staff. The Authority uses data from the metering system for system planning, hydraulic modeling, quantification of I/I in community collection systems, and estimating each community's contribution to total wastewater flow. The MWRA used flow data recorded during calendar year 1995 to calculate wholesale sewer rates for FY97 under its new rate methodology.

Scope

Phase	Scope
Design	Design phase will be performed in-house.
Construction	<p><u>Addition of meters</u> - Addition of 15 wastewater meters to upgrade metered flow coverage in those communities which currently have less than 85 percent coverage and for those communities which have an expected flow metering error greater than plus or minus five percent.</p> <p><u>Replacement of meters</u> - Replacement of meters located at five manhole sites adjacent to local community pump stations with equipment directly connected to the pump stations. This type of meter installation has proven to be more reliable and requires less maintenance than manhole type installations.</p>

Changes in Scope Since FY96-98 CIP None.

CEB Impact

CEB Line Item	FY98	Description
Utilities	\$150	Increased electricity expense associated with additional new meters.
Maintenance	\$38,750	Increased maintenance service and replacement parts for additional new meters.
Other	\$14,250	Increased telephone charge, police details, and vehicle expenses associated with additional new meters.
Total	\$53,150	

1112. Ashland Extension Sewer

Purpose The MWRA will study the feasibility of constructing an extension sewer from the Framingham Extension Relief Sewer to the Framingham/Ashland line. MWRA member communities that do not have direct connections to the MWRA sewer system have expressed concerns that their capacity for development may be negatively affected without these direct connections.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Design	\$1,000	Nov 98	Aug 02
TOTAL:	\$1,000		

**Project
History and
Background**

The Massachusetts Legislature added a requirement to the Commonwealth's FY96 budget that the MWRA perform a feasibility study and design to extend the sewer system to the boundaries of all member communities. There are concerns that by not having direct connection to the MWRA sewer system, a community's development may be negatively affected.

The selected design consultant will evaluate the effect of the new flows on Ashland's sewerage system and the MWRA's Framingham interceptor, will assess the need for construction of a new sewer and auxiliary pumping facilities, and will evaluate environmental and community impacts.

At this preliminary stage, the alignment of the project has not been finalized. The proposed project will commence at the Framingham/Ashland town line and will tie into the MWRA's Framingham Extension Relief Sewer (FERS) interceptor at the Arthur Street DPW yard in Framingham.

Construction costs may vary depending on whether existing facilities can be modified to meet the hydraulic requirements, or whether new construction will be required.

Scope

Project	Scope
Planning/Design	Conduct a feasibility study, analyze costs, and if necessary, prepare designs for projects necessary to extend the Framingham Relief Sewer into the Town of Ashland.

**Changes in
Scope
since FY96-98
CIP**

Project	Change
Ashland Extension Sewer	New project in the FY97-99 CIP.

CEB Impact Not available.



1113. System Master Plan (SMP) Interceptors

Purpose Hydraulic capacity deficiencies exist for five interceptor sewers during peak flow conditions. As a result, surcharging occurs and negatively affects tributary communities. The project will reduce surcharging by rehabilitating or replacing the five interceptors, if necessary, which comprise this project. They are: Mystic Valley, Revere Branch, Neponset Valley, Cambridge Branch, and Malden Branch.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Design	\$2,539	Sep 97	Sep 02
Construction	\$15,870	Mar 03	Mar 05
TOTAL:	\$18,409		

**Project
History and
Background**

The Final CSO Conceptual Plan and System Master Plan (SMP), published in December 1994, recommended that the MWRA proceed with 13 priority A and B projects. Priority A was defined as conduits that surcharge to within six feet of the ground surface or contribute to sanitary sewer overflows. Priority B was defined as conduits that surcharge, but where hydraulic grade line is predicted to be six feet or more below the ground surface. This project includes facilities planning, and capital improvements as necessary, for three priority A conduits, and two priority B conduits.

The SMP Interceptor project includes the preparation of one facilities plan/environmental impact report for the upgrade of five interceptor systems. Based on the surcharging conditions, a hydraulic capacity deficiency exists for each of the interceptor sewers during peak flow conditions. A facilities plan will recommend design alternatives for each of the five interceptors as a follow-up to the initial findings of the CSO System Master Plan.

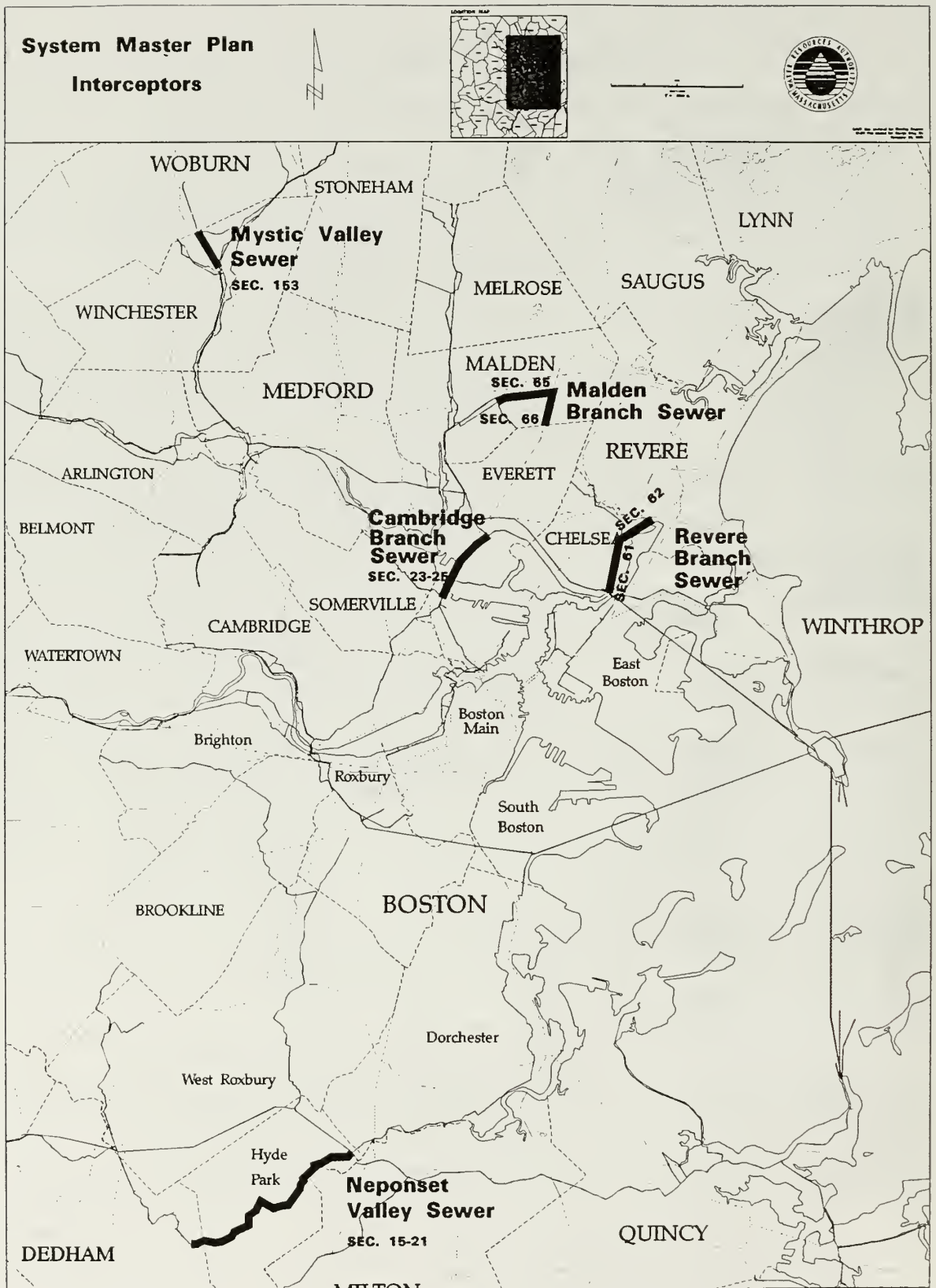
Scope

Project	Scope
Planning/Design	Planning and Design of five interceptor construction contracts.
Mystic Valley Sewer Section	Replacement of 4,250 linear feet of the existing 1.25 foot diameter sewer located on the upper end of the Mystic Valley Sewer in Woburn, with a two foot diameter sewer.
Revere Branch Sewer Sections 61 and 62	Installation of 3,112 linear feet of 4.5 foot diameter relief sewer parallel to the existing four foot diameter sewer. Installation of 3,500 linear feet of four foot diameter sewer parallel to the existing four foot diameter sewer. Sections 61 and 62 extend from the Chelsea Screen House in Chelsea along Eastern Avenue and Crescent Avenue, essentially to Mill Creek in Revere.
Neponset Valley Sewer Sections 15 through 21	Replacement of 17,300 linear feet of existing 48 inch x 50 inch through 54 inch x 56 inch with a new 54 inch, 56 inch, 60 inch, and 66 inch diameter sewer. The sewer runs along River Street to Business Street, crosses the railroad tracks, and parallels Neponset River back onto River Street.
Cambridge Branch Sewer Sections 23 through 25	Installation of 4,935 linear feet of six foot diameter relief sewer parallel to the existing 6.76 foot diameter sewer. The interceptor branches out from the North Metropolitan Sewer, extends along Route 99 to the Charlestown Pumping Station.
Malden Branch Sewer Sections 65 and 66	Replacement of 2,630 linear feet of existing 1.5 foot diameter sewer with a new two foot diameter sewer. The existing sewer runs along Route 99 between Taylor and Salem Streets.

**Change in
Scope
since FY96-98
CIP**

Project	Change
System Master Plan Interceptor	New project in the FY97-99 CIP.

CEB Impact None.



1114. Corrosion and Odor Control Study

Purpose High sulfide levels in the Framingham Extension System are believed to be the cause of corrosion and odors in that system and downstream in the Wellesley Extension Sewer. These elevated sulfide levels generate odors and cause corrosion of the pipe which affect the structural integrity of pipes and pump stations, as well as community relations. The study will identify the causes and sources of odors and recommend corrective measures. It will also provide detailed information about the local sewers in Ashland and Framingham, which will be useful in assessing the feasibility of the Ashland Extension Sewer project.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End Date
Planning/Study	\$702	Jul 96	Feb 98
TOTAL:	\$702		

**Project
History and
Background**

The MWRA is aware of the problems caused by sewer odors produced by hydrogen sulfide, both as they affect the structural integrity of pipes and pump stations, as well as straining community relations. Recent collapses in the Framingham Extension Sewer (FES) have caused staff to focus in that area. Odor complaints have been received from residents abutting both the FES and the Wellesley Extension Sewer (WES) systems resulting in the settlement of legal claims totalling several hundred thousand dollars.

This situation prompted staff to experiment with adding odor control chemicals at various points in the local systems and FES to try to reduce the levels of odor due to hydrogen sulfide. The results were mixed; not all of the chemicals were effective even over the short range, and none was capable of eliminating hydrogen sulfide completely through the length of the FES. Chemicals used have included potassium permanganate, hydrogen peroxide, two types of calcium nitrate, and ferrous chloride, with costs ranging from \$1,000 to \$2,000 per day.

While the MWRA attempts to minimize odor impacts through chemical intervention and sealing locations where odors escape, a more permanent solution

is being sought. The MWRA believes that high sulfide levels in the FES system are a major contributing factor to the corrosion and odors existing both in the FES and downstream in the WES system. There is speculation that the sulfide levels originate in the municipal tributary sewerage systems and transfer into the MWRA's interceptors.

Scope

Project	Scope
Planning/Design	Identify causes and sources of odors; collect local sewer system information in Ashland, Natick, and Framingham; recommend long-term corrective measures.

**Changes in
Scope
Since FY96-98
CIP**

Project	Change
Corrosion and Odor Control Study	New project in the FY97-99 CIP.

CEB Impact

The recommendations from this study may result in changes to operating and maintenance practices. Staff will assess the CEB impact of these recommendations as the study progresses.

1115. Wastewater Facilities Rehabilitation

Purpose

The MWRA has recognized the continuing need for a systematic approach to maintaining its existing wastewater facilities. Systematic repairs and rehabilitation are critical to ensuring the safe and efficient operation of these facilities, and to avoiding the greater capital costs of complete replacement of badly deteriorated facilities.

This project consists of two phases designed to meet this need. The first phase will include the development of a formal procedure for the annual evaluation of each wastewater facility, comprehensive inventory, and evaluation of capital needs for an initial group of facilities. The second phase includes the design and construction of priority capital improvements.

MWRA engineering and operations staff are coordinating current rehabilitation projects with those identified under this project. All rehabilitation will be incorporated into the baseline information for each facility.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Inventory and Evaluation	\$352	Mar 97	Apr 99
Design and Construction	\$400	Jul 98	Apr 99
TOTAL:	\$752		

Project History and Background

The Sewerage Division Plan evaluated the condition of the Division's interceptors and facilities, and identified general maintenance and rehabilitation needs. The Wastewater Facilities Rehabilitation project will focus in greater depth on the Division's 34 facilities, including six CSOs, 14 pumping stations, five headworks, and nine miscellaneous structures. As part of this study, a comprehensive facility inventory will be compiled and subsequently used by staff for both short- and long-term maintenance planning.

The 34 facilities will be divided into several groups based on functionality (e.g., pump stations), status, and the condition of each. The inventories and evaluations of these facilities will be phased over a period of five or six years, with groups of six or seven facilities reviewed each year. Staff will use the comprehensive facilities inventories to assess the condition of each facility, and identify immediate and deferrable maintenance needs.

Scope

Project	Scope
Inventory and Evaluation	Produce a comprehensive inventory (building components and equipment) of each of the division's 34 facilities one group at a time, and identify inadequacies requiring attention within the next five or six years. Provides funds for two groups of facilities.
Design and Construction	Rehabilitative design and construction for each group of facilities evaluated.

Changes in Scope Since FY96-98 CIP

Project	Change
Wastewater Facilities Rehabilitation	New project in the FY97-99 CIP.

CEB Impact

The total incremental cost in the FY00 CEB is approximately \$100,000 for additional maintenance projects to be identified as part of this study. The recommendations from each phase of this study may include maintenance projects appropriately funded through the CEB. Also, the level of maintenance and rehabilitation is expected to increase after five years as facilities age.

1201. Remote Headworks Rehabilitation

Purpose Improvements are necessary to the three remote headworks to ensure effective operation, safe working conditions for employees, and to extend the useful life of these facilities.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/RI/Construction Services	\$217	Nov 94	Oct 96
Construction	\$3,217	Jul 93	Sep 97
Technical Assistance	\$92	Jul 93	Apr 97
TOTAL:	\$3,526		

**Project
History and
Background**

The remote headworks are located at Chelsea Creek in Chelsea, Columbus Park in South Boston, and Ward Street in Roxbury. These facilities provide pretreatment of the North System's sewage prior to its entering the Deer Island tunnel system. The three headworks facilities were built in the 1950s and 1960s and rehabilitated in 1987, though the 1987 rehabilitation did not address all the problems at the headworks.

Improvements are necessary due to the following conditions:

- Exterior paving is in need of repair due to cracking, pot holes, and improper sloping for drainage.
- The headworks tile floors are worn and have missing and uplifting tiles which create safety hazards.
- Suspended ceiling panels are broken, stained, or missing.
- The grit hoppers have become corroded and are no longer capable of safely storing grit.
- The emergency generators are undersized for the operation of new equipment installed during the 1987 rehabilitation, and cannot provide enough power to operate the HVAC systems during electrical shutdowns.

- Lack of proper ventilation is a safety hazard to employees. There are no toilet and locker facilities for female employees.
- The gratings at all three facilities are either loose, bent up, or twisted, creating tripping hazards.
- Most of the guard rails are only 37 inches in height, which is lower than the standard 42-inch rail height required by the Occupational Safety and Health Act.
- The freight elevators have been in use for more than 20 years and are in need of repair to ensure safety and compliance with current Massachusetts codes.

Scope

Phase	Scope
Rehab Des/CS 1	Design and construction services for Rehab-Construction 1 phase.
Rehab-Constr 1	Installation of new paving at Columbus Park and Ward Street, new suspended ceiling systems at the Chelsea Creek and Ward Street facilities, and new tile flooring in the operations room, lunch areas, and locker rooms at the Chelsea Creek and Columbus Park facilities.
Rehab-Design 2/RI	Design for Rehab-Construction 2 phase.
Rehab-Constr 2	Installation of direct discharge piping to RO/RO containers.
Rehab CS/RI 2	Construction services and resident inspection for Rehab-Construction 2 phase.
Rehab Design 3	Design for Rehab-Construction 3 phase.
Rehab Constr 3	Installation of properly-sized generators, switchgear, and transfer switches; construction of female locker, shower, and restroom facilities; and replacement of grating and railings at all three facilities.
Rehab CS/RI 3	Construction services and resident inspection for Rehab-Construction 3 phase.
Technical Assistance	Technical Assistance was provided for emergency generators, female locker facilities, grating, and guard rails.
Elevator Rehab-Design	Design for Elevator Rehab-Construction phase.
Elevator Rehab-Construction	Freight elevator shaft repairs and replacement or modification of the head house structure, operating mechanism, controls, and cab.

Changes in Scope Since FY96-98 CIP

None.

CEB Impact

None.

1202. Boston Harbor Performance Certification

Purpose Performance certification for the Boston Harbor Project is required by funding agencies to maintain project eligibility for federal and state grant and loan programs. Phase I of the Boston Harbor Project will be on-line in mid 1996; written certification for this phase must be complete by mid 1997.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Phase I - III	\$1,500	May 96	Apr 99

**Project
History and
Background**

Performance certification, an independent evaluation of a project's ability to satisfy specific performance standards, is generally a requirement of state and federal grant funding and loan programs. If the facilities meet performance standards, they are certified. If the facilities do not meet performance standards, corrective action is required before final release of grant funds. Certification of the new Deer Island Treatment Plant's performance will furnish the MWRA with an independent evaluation of the equipment and system's ability to function as designed. It will also give extra assurance that the design, construction, and operation have interfaced effectively to produce a functional plant.

The Boston Harbor Project consists of many interrelated projects that cannot be judged independently. Therefore, evaluation will be performed on groups of projects after they have reached substantial completion and have operated for a period of time. Certification will be performed on three operational phases by a single, independent consultant using data generated by the Deer Island Treatment Plant, Environmental Quality Department, Lead Design Engineer, Project Design Engineer, Construction Manager, and the selected consultant.

Scope

Phase	Scope
All Phases	<p>Provide expert, unbiased evaluation of the new Deer Island Treatment Plant's operating performance during and following each defined operational phase.</p> <p>Provide project certification when performance standards are met.</p> <p>Assist in the development of any corrective action plan deemed necessary.</p> <p>Provide reports and back-up data to support conclusions.</p>

**Changes in
Scope
since FY96-98
CIP**None.

CEB Impact

Staff will project CEB impacts pending completion of each phase of this project.

1203. Deer Island Treatment Plant Outfall #002 Repair

Purpose Outfall 002 at Deer Island requires repairs to ensure the structural stability of the treatment plant to discharge peak wet weather flows and to serve as a back up for the new Deer Island effluent outfall tunnel.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Construction	\$1,309	Oct 95	Mar 96
TOTAL:	\$1,309		

**Project
History and
Background**

During the execution of the Boston Harbor Project, an underwater diving exploration found a major failure in Outfall 002, one of the two main effluent discharge outfalls at Deer Island. Outfall 002, built in 1896, discharges approximately 25% of Deer Island flow.

Scope

Phase	Scope
Construction	Repair damaged section of Outfall 002. Work includes sliplining of approximately 130 feet of cracked and structurally weakened pipe, replacement of 100 feet of missing pipe, and removal of sediment and debris from the outfall breach and from the diffuser section.

**Changes in
Scope
Since FY96-98
CIP**

None.

CEB Impact

None.

1203. Deer Island Treatment Plant Outfall #002 Repair
Treatment

1204. Deer Island Primary and Secondary Treatment Facilities

Purpose

The Massachusetts Water Resources Authority is constructing a wastewater treatment plant and related facilities to minimize the pollution of Boston Harbor. The new Deer Island Primary and Secondary Treatment Facilities are the largest component of the Boston Harbor Project (BHP), an 11-year, \$3.25 billion effort started in 1988 to comply with the requirements of the federal Clean Water Act and to improve the harbor for recreational and commercial uses.

For purposes of capital budgeting and project organization, the Deer Island Primary and Secondary Treatment Facilities component of the Boston Harbor Project is composed of fifteen phases, with the eight major remaining active and planned phases listed in the table below. Descriptions of the major phases and the contracts included within these phases are presented separately.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Site Facilities Construction	\$232,949	Jun 89	Jun 00
Pretreatment & Primary Construction	\$666,727	Dec 90	Dec 97
Secondary Construction	\$901,896	Aug 90	Feb 00
On-Island Residuals Construction	\$311,437	Aug 91	Jun 97
Permanent Utilities Construction	\$187,064	Jul 91	Oct 99
Construction Support Services	\$75,437	Oct 89	Mar 00
Construction Management	\$351,338	Apr 88	Dec 04
Lead Design Services	\$110,365	Aug 88	Jun 99
Other: remaining design phases	\$171,844	Oct 88	Jun 00
TOTAL:	\$3,009,057		

Project Scope Prior to start of the project, 43 cities and towns in metropolitan Boston transported sewage to the MWRA's two outdated primary sewage treatment plants which discharged 500 million gallons of poorly treated wastewater to the harbor each day. In addition, 500,000 gallons of processed sludge were discharged daily to the harbor on the outgoing tide. These discharges, plus the untreated wastewater that flowed into the harbor from combined sewer overflows, made Boston Harbor among the most polluted bodies of water in the nation.

The Boston Harbor Project is the second largest public works project ever undertaken in New England. The centerpiece of the project is the construction of a new primary and secondary treatment plant on Deer Island. When completed in 1999, the plant will be the second-largest sewage treatment plant in the nation.

The MWRA is carrying out the BHP under a federal court order issued by U.S. District Court Judge A. David Mazzone. In December of 1982, the City of Quincy filed suit in Massachusetts Superior Court, charging that wastewater discharges to Boston Harbor were in violation of the federal Clean Water Act of 1972, which requires secondary treatment of wastewater discharges. Judge Mazzone ordered the construction of the new primary and secondary facilities and, on May 8, 1986, issued a timetable for the project.

On June 16, 1993, the MWRA submitted a report to the Federal Court which focused on MWRA efforts to reevaluate the scope of the project to achieve compliance with environmental requirements in the most cost-effective manner. The report outlined a strategy for development of steps that might lead to significant project savings, including savings on the secondary treatment plant.

The Secondary Treatment Facilities Plan completed in 1988 called for four batteries to handle levels of wastewater flows and pollutant loads projected for the 30-year planning period, based on information available at the time. Recent information has provided evidence that peak and average flows are likely to be significantly smaller than projected. A study has been completed which determined that all four batteries are not needed to meet Clean Water Act requirements for providing secondary treatment. Judge Mazzone has approved the MWRA's recommendation to eliminate Battery D and related facilities from the design of secondary treatment for Deer Island. The MWRA removed the cost associated with Secondary Reactor and Clarifier Battery D and Residuals Facilities Phase II from the FY96-98 CIP.

Construction of the new primary plant began in 1990. The court schedule called for half of the primary plant to be completed by mid-1994, with the entire primary plant completed and operational by mid-1995. The MWRA began operation of the first phase of the new plant in January 1995. Batteries C and D and the first module of residuals were completed in July 1995. Construction of the secondary plant began in late 1992, and is scheduled for completion in 1999.

Treatment Plant Operations The new plant will provide state-of-the-art primary treatment, which will remove 55 percent of solids and reduce biochemical oxygen demand (BOD) by 35 percent. Secondary treatment will further purify the wastewater, removing 85 percent of solids and 50 to 90 percent of toxins. Biochemical oxygen demand will be further reduced to a total of 85 percent.

Sewage from the MWRA's 43 communities will be delivered to the new plant from several headworks, which screen out large objects that would damage equipment. Wastewater from the 22 communities in the MWRA's North Collection System will travel to the Deer Island plant through two existing deep-rock tunnels under the harbor, and through the North Metropolitan Sewer in East Boston and Winthrop. Sewage from the 21 cities and towns in the MWRA's Southern Collection System will receive grit and screening removal at the new Nut Island headworks in Quincy before flowing to Deer Island through the five-mile cross-harbor tunnel the Authority is constructing as part of the project.

When the wastewater arrives from the North Collection System at the Deer Island North Main Pump Station/Winthrop Terminal Facility (NMPS/WTF), and from the South Collection System at the South System Pump Station (SSPS), it will be pumped to new primary clarifiers or sedimentation tanks, where it will be retained for one to two hours. During that time, most of the heavier suspended solids will settle to the bottom of the tanks. There, plow-like scrapers will move the solids to a sump or hopper at the entry end of the tank where they will be drawn out of the bottom of the tank. These solids, called primary sludge, will be pumped to gravity thickeners and ultimately to digesters in the residuals area for further treatment.

Secondary treatment will use aeration tanks to create a highly controlled environment in which microorganisms, naturally present in wastewater, consume suspended solids in the primary effluent. Oxygen will be added to encourage rapid growth of these helpful microorganisms. As a result, suspended solids will be converted to heavier solids. After about two hours, the mixture of wastewater and microorganisms will flow to sedimentation tanks, or secondary clarifiers,

similar to those used during primary treatment. These microorganisms and other suspended matter will physically settle to the bottom.

A portion of the settled sludge that contains a high concentration of microorganisms will be recycled to aeration tanks to perpetuate the feeding process. The excess material, not necessary for maintaining the biological process, is called secondary waste activated sludge (WAS) and will be removed from the process and pumped to the residuals area.

The secondary sludge will be thickened in centrifuges to decrease its liquid volume. The primary and thickened secondary activated sludge will then be blended and biologically stabilized in sludge digesters for at least 15 days to further decrease volume and remove odor and disease-causing organisms. The sludge will then be processed through additional centrifuges to remove some of the remaining liquid to further decrease volume. The thickened sludge will be shipped by barge to the Fore River Staging Area in Quincy where it will be converted to fertilizer pellets through a heat drying process.

At the end of the treatment process, the remaining wastewater will be disinfected with sodium hypochlorite to remove any remaining disease-causing organisms. Provisions have also been made for dechlorinating the effluent with sodium bisulfite, if studies find that the process is required. The treated effluent will then be discharged to the ocean through the 9.5-mile effluent outfall tunnel, where it will be released in deep water through 55 diffusers to ensure thorough mixing of the effluent with seawater.

Project Management

The MWRA established the Program Management Division (PMD) to manage the design and construction of the new treatment facilities. PMD is assisted by two consultant teams: the Construction Manager (CM) and the Lead Design Engineer (LDE). In June 1990, the Board of Directors approved a five-year contract for a Construction Management (CM) Services Team, to be led by ICF Kaiser Engineers, Inc., for the period from January 1991 to December 1995. This contract has been extended to continue CM services and resident inspection from January 1996 through December 1998. Metcalf and Eddy was awarded the five-year LDE contract in August of 1988. The contract was subsequently extended to December 1995 and then to December 1997.

CEB Impact

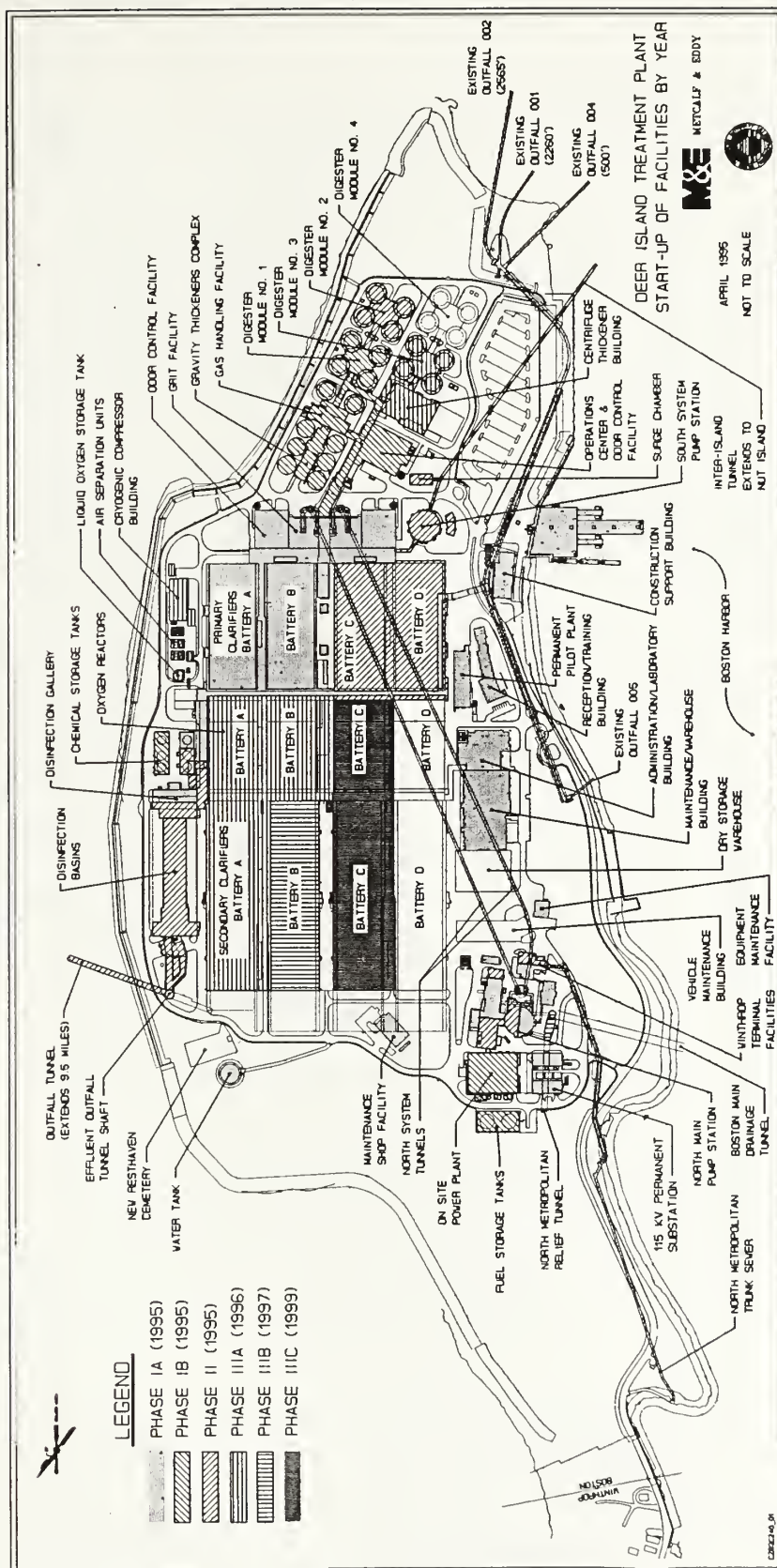
The CEB impact of the completion of the Boston Harbor Project represents the net effect of reductions to Nut Island's budget as it moves from being a treatment plant to a headworks, offset by increases to Deer Island's budget as it begins treatment of south system flows and provides secondary treatment for flows throughout the system. The impact also includes the incremental cost of performing additional outfall monitoring in Massachusetts Bay after the Effluent Outfall tunnel comes on-line.

Deer Island Treatment Plant (\$000's)

CEB line item	Incremental Costs FY98	Incremental Costs FY99	Incremental Costs FY00	Incremental Costs FY01-02	Description
Labor	\$0	\$0	\$0	\$224	Reductions: Increased vacancy rate FY98; no additional staff after FY97 Increases: temp & contract employees
Chemicals	\$917	(\$423)	\$0	\$45	Lower disinfection costs for primary and secondary than expected
Utilities	\$1,401	(\$107)	(\$127)	\$859	Credits for CTGs and STGs FY98 and beyond; Secondary comes on-line
Maintenance	\$628	(\$147)	\$251	\$154	Several maintenance contracts are now included in Other (Professional Services)
Other	\$858	\$1,371	\$1,409	\$994	Public access; RO/RO continuation; BECo contract; CSCs; other service contracts; increased outfall monitoring
TOTAL:	\$3,804	\$694	\$1,533	\$2,276	

Deer Island Central Laboratory (\$000)

CEB line item	Incremental Costs FY98	Incremental Costs FY99	Incremental Costs FY00	Incremental Costs FY01-02	Description
Labor	\$0	\$0	\$0	\$0	
Chemicals	\$0	\$0	\$0	\$0	
Utilities	\$0	\$0	\$0	\$0	
Maintenance	\$7	\$7	\$8	\$17	Equipment maintenance expense will continue to increase due to aging of the lab equipment.
Other	(\$25)	\$24	\$23	\$62	Equipment replacement needs will increase as the equipment becomes obsolete.
TOTAL:	(\$18)	\$31	\$31	\$79	



1204. Deer Island Primary and Secondary Treatment Facilities
Overview

Site Facilities Construction

Purpose

The Site Facilities construction phase of the BHP consists of 20 construction contracts with an estimated total cost of \$232.9 million. These contracts are necessary to prepare the site for construction of the Primary and Secondary Treatment Facilities and to provide support facilities required for plant construction. A ten-year supply and delivery contract for concrete is included in this phase.

Expenditure Forecast and Schedule

Construction Package	Contract	Total Contract Amount (\$000)	Begin date	End date
CP-020 (complete)	Asb Rmvl-Fort Dawes	\$518	Jun 89	Jan 90
CP-021 (complete)	Demo Ft. Daw Bunkers	\$4,617	Aug 89	Apr 90
CP-022 (complete)	Earthwks/Lndfl/Rdways	\$17,107	Jan 90	Nov 91
CP-023 (complete)	Pump Sta Mods & Sews	\$5,713	Jan 90	Nov 90
CP-024 (complete)	Ad/Lab Mnt/Whse Bldg	\$48,921	Apr 92	Dec 94
CP-027 (complete)	Maint Shop Fac Ph I	\$395	Sep 91	Apr 92
CP-028 (complete)	Maint Shop Fac Ph II	\$1,970	Dec 91	Sep 92
CP-030 (complete)	Disposal of Excess Till	\$14,137	Aug 90	Dec 91
CP-040 (complete)	DI Demo/Drumlin Exc	\$16,758	Dec 91	Jun 94
CP-042	Removal of Temp Fac	\$270	Jul 99	Dec 99
CP-043	Site Prep/Dem Exs Plant	\$40,336	Feb 94	Sep 97
CP-048	Western Shoreline Prot	\$20,210	Apr 97	Mar 99

CP-044	Final Paving & Lndsping	\$29,088	Apr 98	Jun 00
CP-045	Dry Storage Building	\$4,196	Oct 97	Dec 99
CP-049 (complete)	Haz Mat Rem Ph I	\$7,433	Jun 91	Jun 94
CP-050 (complete)	Haz Mat Rem Ph II	\$1,660	Apr 94	Apr 96
CP-051	Haz Mat Rem Ph III	\$1,910	Apr 96	Mar 98
CP-905	Sup & Del of Concrete	\$12,980	Apr 90	Dec 99
(complete)	Int Transf & Switchgear	\$216	Jan 90	May 90
CP-805 (complete)	DI Sludge Transfer Fac	\$4,514	Oct 90	Sep 91
	TOTAL:	\$232,949		

The following narrative provides descriptions for only active contracts in this phase.

Removal of Temporary Facilities (CP-042)

This contract funds the removal of the concrete batch plant foundation and the Suffolk Downs parking facility.

Late Site Preparation/Demolition of Existing Treatment Plant (CP-043)

The process of decommissioning the existing primary treatment facilities began with the start-up of Primary Clarifier Batteries A and B. These original facilities will be fully decommissioned as the MWRA is able to completely rely on the new plant. In addition to demolition, the area will be filled and graded in preparation for the construction of Secondary Battery C. This contract has also included additional paving, landscaping, and demolition.

The south and west roadways will be ready for paving when the primary treatment facilities (Administration/Laboratory; Maintenance/Warehouse Building; South System Pump Station and Inter-Island Tunnel shaft; North System Headworks; and primary residuals handling facilities) are substantially complete. This construction contract will also include pathways, drainage, sidewalks, and curbing, and will prepare for additional landscaping.

The Northern Revetment protection adjoins the concrete seawall shoreline protection included in the Primary Residuals contract (CP-301) and the Disinfection Facilities contract (CP-204). This will complete the shoreline protection on the northern, eastern, and southern portions of Deer Island. The revetment type construction consists of largely rip rap (stone embankment) construction/rehabilitation, rather than major seawall construction, and is needed to protect the northern landform and Shirley Gut from ongoing erosion and to decrease the need for continued maintenance and repairs.

Western Shoreline Protection (CP-048)

The Western Shoreline Protection contract continues shoreline protection included in the Primary Residuals (CP-301), Disinfection Facilities (CP-204), and Late Site Preparation contracts (CP-043). This will complete the shoreline protection for all of Deer Island. This portion of shoreline protection is a mixture of revetment type construction, consisting primarily of large rip rap and a mini-concrete seawall in some areas. It is needed to prevent erosion on the main access road along this shoreline and to protect major plant utilities under the roadway.

Replacement of the Shirley Gut Siphon, located on the western shoreline of Deer Island, is included in the project budget..

Final Paving and Landscaping (CP-044)

The Final Paving and Landscaping contract includes development of the final land forms, construction of the north and east roadways, and all remaining landscaping of permanent buildings. Removal of a temporary wheel wash facility, a temporary fuel facility, and a trash facility are included in this contract, as well as a pier security building and a permanent parking lot. Work under this contract will begin once permanent facilities are substantially complete.

Dry Storage Building (CP-045)

The Maintenance/Warehouse building's north end may be extended to incorporate additional dry bulk storage warehousing, electrical shop space, heated garage bays for heavy motor vehicles, and a covered trackway for access to shops. Additional storage space may also be needed for equipment, hazardous materials, sand, and salt. The final configuration will be determined through the preparation of a feasibility study included in the DP-40 scope.

Hazardous Material Remediation Phase I (CP-049)
Hazardous Material Remediation Phase II (CP-050)
Hazardous Material Remediation Phase III (CP-051)

Existing hazardous waste on Deer Island is being remediated while construction of the new treatment facilities proceeds. Hazardous waste investigations began as part of the scope of work for the Early Site Preparation design. Site investigations indicated that contamination on the island was more extensive than originally estimated in the Facilities Plan. In response to the contamination encountered, an island-wide approach to hazardous waste site assessment and remediation was adopted.

A hazardous materials management consultant (DP-27) was contracted to complete site investigations, design an island-wide remediation plan, and acquire the necessary regulatory approvals for implementing remediation.

The Hazardous Waste Remediation contractor (CP-049) stockpiled contaminated materials removed from construction areas, tested materials to determine if they should be reprocessed or shipped off-site for disposal, reprocessed suitable materials into asphalt to be used on Deer Island, and shipped unsuitable materials for disposal to licensed facilities. The contractor also installed and operated a system to remove oil from groundwater, provided disposal for hazardous wastes other than contaminated soil (buried drums, etc.), and provided emergency response for spills and new discoveries of hazardous materials.

The second phase of remediation was extended through CP-050 for an additional two years from the original contract. A third phase extends the services for another two years through CP-051 to unearth and handle additional contaminated soil, to continue groundwater recovery and treatment, and to meet DEP requirements for additional site remediation.

Supply and Delivery of Concrete (CP-905)

Construction of the treatment plant and the tunnels requires approximately one million cubic yards of concrete over a ten-year period. Due to a mitigation agreement with the Town of Winthrop, this quantity cannot be transported through the town. As a result, the MWRA entered into a ten-year contract with a concrete supply firm to produce all the standard classes of concrete required for the project at the construction site. The mixing facility is located on-island because concrete must be placed in forms shortly after mixing and therefore could not be barged from an off-island plant. Each contractor must purchase concrete from this supplier.

The contract requires the supplier to barge all bulk concrete materials to the island, off-load at the bulk piers, and maintain a reserve of raw materials within a specified area. The supplier is required to produce up to 1,600 cubic yards per eight hour shift and to guarantee delivery to each of the contractors within the first six hours of the work day. Since concrete is such a significant component of the construction process, capacity and quality control are extremely important.

Each contractor enters into a contract with the supplier for supply and delivery of each type of concrete at a fixed unit price. The unit price is established to recover the concrete operator's cost of plant construction, operation, and demolition. Therefore, each sub-phase budget includes an amount for the required quantity of concrete at its specific unit cost. The sub-phase budgets do not provide for the plant operator's recovery of inflation related increases in labor and material. These inflation payments are included in CP-905. Since 1992, and continuing for the life of the contract, the MWRA has been making quarterly payments to the concrete plant operator for the higher costs, using an industry accepted inflation index.

Pretreatment and Primary Construction

Purpose The Pretreatment and Primary Plant Construction phase includes contracts for the construction of the inter-island tunnel, pretreatment facilities on Nut Island and Deer Island, primary transmission facilities, primary clarifiers, and ancillary primary plant facilities. Pretreatment and Primary Plant construction is estimated to cost \$666.7 million.

Expenditure Forecast and Schedule

Construction Package	Contract	Total Contract Amount (\$000)	Begin date	End date
CP-101 (complete)	North System Tunnels	\$20,622	Dec 90	Jul 92
CP-102	North Main Pump Station	\$90,088	Jun 91	Apr 97
CP-103 (complete)	North System Hdwks	\$96,096	May 91	Dec 94
CP-104	South System Pump Station	\$41,043	Nov 91	May 97
CP-105 (complete)	Pri Clar Batt A & B	\$100,570	Mar 91	Dec 94
CP-107	Gallery (CP-024 & Pri X-Gal W)	\$0		
CP-130 (complete)	Prim Clar Batt C & D	\$84,379	Mar 92	Jul 95
CP-151	Int-Island Tun/Ext Outfl	\$143,854	Apr 91	May 97
CP-152	Nut Island Headworks	\$65,323	Jul 92	Nov 97
CP-153 (complete)	Nut Island Hdwks Equip	\$347	Mar 91	Mar 92
CP-160	Ancil DI Mods Ph I	\$9,005	Mar 95	Dec 97
new contract	Surge Containment	\$3,900	Jan 97	Dec 97
new contract	Concrete Coating / Repair & Upgrade	\$11,500	Mar 97	Dec 97
	TOTAL:	\$666,727		

The following narrative provides descriptions for only active contracts in this phase.

North Main Pump Station (CP-102)

The existing North Main Pump Station (NMPS) will be retained and modified for use in the new plant. Ten sewerage pumps, drives, and related mechanical systems will be removed and replaced. Five 700 kilowatt generators will be removed and motor starters, motors, transformers, and variable frequency drives will be installed. Four new 13.8/4.16 kilovolt transformers will also be installed. New valves on both the suction and discharge sides of the pumps will be inserted and new discharge headers inside and outside of the station will be added.

This contract also includes construction of an odor control facility. This facility will collect and treat odor-laden air from the Winthrop Terminal and the two on-island north system tunnel shafts. Underground concrete ducts will transport the air to the odor control facility where scrubbing and absorption equipment will be used to treat the air prior to its discharge through stacks. Modification of the southern end of the existing NMPS power plant will be required to accommodate these facilities. Connecting piping and the twin surge tanks necessary to tie to the North System Tunnels (CP-101) will also be built under this contract.

The Winthrop Terminal Facilities will also be retained and modified for use in the new plant. Six pumps and related mechanical systems will be removed and replaced. New discharge lines and 4.16 kilovolt switchgear will be installed. The existing motor room will be expanded.

South System Pump Station (CP-104)

The South System Pump Station, located to the west of the North System Headworks, will pump screened and dewatered wastewater from the Inter-Island Tunnel to the treatment facilities at Deer Island. Under normal operation, south system flow will be discharged to the effluent channel in the pretreatment gallery of the North System Grit Facility, where it will be combined with the dewatered North System flows. The pump station will include eight 60-mgd raw wastewater pumps: six to handle peak flows, and two to provide back-up capacity.

Gallery Between Administration/Laboratory Building CP-024 and Primary Cross Gallery (CP-107)

A temporary above ground passageway between the new Administration Building and the primary cross gallery is required to allow protected access for personnel

and electric carts until a permanent passageway is constructed between the support building and the secondary cross gallery. The scope and budget for this work has been transferred to CP-260.

Inter-Island Tunnel / Extended Outfall Protection (CP-151/031)

The Inter-Island Tunnel and shafts will transport wastewater flows from Nut Island to Deer Island. This contract includes construction of a concrete-lined deep rock tunnel measuring approximately 11.5 feet in diameter and 25,000 feet in length. A 16-foot diameter shaft on Deer Island and an 11-foot diameter influent tunnel that connects the Deer Island shaft with the South System Pump Station has also been constructed. Construction of a 16-foot diameter shaft on Nut Island, a 12-foot by 12-foot headworks effluent channel connecting the Nut Island shaft and headworks facility, and a 36-inch diameter stub pipeline for future connection with the Braintree-Weymouth tunnel system are also included in this contract.

In addition, twin 14-inch sludge pipelines will be embedded within the tunnel and the Deer Island shaft to allow pumping of sludge from Deer Island to the Fore River residuals processing facility starting in mid-2001. This contract also provides for construction of 1,500 linear feet of a reinforced concrete relieving slab to protect the existing outfall and junction chamber from construction equipment and truck traffic. A connection from the new bypass conduit to the existing plant outfall conduit will also be constructed. Protection of the existing conduit required drilling and placing 28,000 linear feet of piles and relocation and protection of existing utilities. On November 4, 1995, operators of the tunnel boring machine broke through from the Inter-Island Tunnel to the Nut Island shaft, connecting the two islands.

Nut Island Headworks (CP-152)

The Nut Island Headworks will screen out large objects and remove sand and other grit from the wastewater before the flow is conveyed through the Inter-Island Tunnel to the new primary treatment facilities.

This contract includes construction of the following facilities:

- Bar screens
- Grit separation chambers
- Odor control facilities
- Emergency generator
- Truck bays for removal of grit and screenings

- Operation and maintenance areas
- Administration area
- Headworks influent/effluent conduit
- Community historic room
- Water storage tank and fire pump
- Fuel oil storage tank for energy generators

All inter-connecting piping, electrical and control systems, plumbing fixtures, and related mechanical equipment are also included.

The existing Nut Island Wastewater Treatment Plant will remain in operation throughout the construction of the new headworks facility. In order to accomplish this, modifications and relocation of some of the existing facilities had to occur prior to the start of the headworks construction. Existing facilities affected by the location of the headworks facility include the pre-aeration basins, the generator wing of the main building, the gas control building, and approximately 300 feet of the plant influent and effluent conduits.

Modifications to the pre-aeration basin were substantial. Pre-aeration Basins No. 1 through 3 were demolished and all existing plant flows now pass through Pre-aeration Basin No. 4.

All of the existing treatment plant structures will be demolished after completion of the headworks facility. A passive park landscaped with trees, shrubs, and jogging paths will be constructed along the north and east shores. Overlooks and seating areas will be located on the east and west shores of the Island.

Nut Island Headworks Equipment (CP-153)

An 800 kilowatt diesel generator has been purchased to provide an essential backup power supply to the current plant. Once the existing treatment plant is dismantled, this generator will be used in the new Nut Island Headworks.

Ancillary Deer Island Modifications Phase I (CP-160)

This contract includes modifications of the following facilities: containment/scum control, pier facility, scum disposal, metal and chlorine buildings, plant-wide pigging system, chemical storage facility at NMPS, microwave tower, temporary parking lots and guard shack, lubrication oil storage, North Metropolitan Sewer abandonment, and demolition of service area #5.

There is an existing problem with scum build-up and surge containment/scum control in the North System Tunnel Shafts 1 and C. The conversion of pumps in the North Main Pump Station (NMPS) from diesel power to electric power raises the possibility that in the event of complete power failure, both Shafts 1 and Shaft C will act as surge relief. Without surge relief provisions, incoming raw sewerage will rise and overflow the containment structure.

The Deer Island Pier will be modified to meet future transportation needs as well as requirements for pipe chase and valve pit, chemical loading, safety, and fire protection.

The original purpose of the metal and chlorine buildings was to provide temporary vehicle maintenance and storage space. It has been determined that with minor modifications these facilities can provide these services permanently. Therefore, the proposed permanent dry storage building has been significantly reduced in size and the proposed permanent vehicle maintenance building has been eliminated.

Surge Containment

This contract will construct an additional surge structure at the existing North Main Pump Station (NMPS) to protect the facility from water damage in case of a power failure to the NMPS pumps.

Concrete Coating / Repair & Upgrade

Due to the higher than anticipated concentrations of Hydrogen Sulfide in the influent to the new plant there has been some deterioration of the concrete and concrete coating at several locations. The deterioration is primarily at the water line in various facilities and will require the repair of the concrete and the application of a new protective coating.

Secondary Plant Construction

Purpose

The Secondary Plant construction phase includes construction of three secondary reactor batteries, three secondary clarifier batteries, a full treatment pilot plant, a disinfection facility, a seawall, a hydroelectric power station, an effluent outfall tunnel and diffusers, and a potable water storage tank. The total cost of Secondary Plant construction is estimated to be \$901.9 million.

- Three secondary reactor batteries, or aeration tanks, will be constructed. Oxygen will be supplied to these tanks from a cryogenic generator. The aeration tanks will contain microorganisms to biologically treat the wastewater. Three secondary clarifier batteries will be constructed to serve as settling tanks for this mixture.
- A pilot plant has been built and is being used as a research tool for testing operation prior to use in the full scale facilities and to provide a permanent facility for operator training.
- A disinfection facility is being constructed which will add chlorine to the primary and secondary effluent. A hydroelectric facility powered by the effluent flows from the disinfection facility is also being constructed as part of this phase. The plant has been designed to produce more than 12 million kilowatt hours of electricity per year.
- A deep rock effluent outfall tunnel and diffusers are also being constructed to carry treated effluent from Deer Island into Massachusetts Bay. Other secondary treatment plant facilities included in this phase are a secondary odor control facility, the secondary operations building, and the waste sludge system.

Expenditure Forecast and Schedule

Construction Package	Contract	Total Contract Amount (\$000)	Begin date	End date
CP-201 (complete)	Permanent Pilot Plant	\$11,942	Dec 91	Dec 94
CP-202	Sec Reactor Batt A & B	\$117,302	Nov 92	Mar 97

CP-203	Sec Clar Batt A & B	\$146,162	Aug 93	Dec 97
CP-204	Disinf Fac Ph I Seawall	\$41,846	Aug 92	Feb 96
CP-205 (complete)	Water Storage Tank	\$9,061	Dec 92	Jan 95
CP-210	Ancil DI Mods Ph II	\$2,553	Jul 96	May 97
CP-211	Ancil DI Mods Ph III	\$7,211	Apr 97	Dec 99
CP-241	Disinf Fac Ph II	\$36,541	Jul 93	Aug 96
CP-242 (deleted)	Disinf Fac Ph III	\$0		
CP-260	Sec C React & Clar Batt	\$144,372	Jan 97	Feb 00
	Prepurchase	\$959	Jun 93	Dec 96
CP-282	Effluent Outf Tunnel	\$274,954	Aug 90	Sep 98
CP-283 (complete)	Effluent Outf Diffusers	\$77,088	Aug 90	Nov 92
CP-285 (complete)	Effl Outf Tun Muck Proc & Disposal	\$14,449	Sep 91	Nov 94
CP-286	Effl Outf Tun Muck Proc & Disposal Ph II	\$17,456	Dec 94	Jul 97
	TOTAL:	\$901,896		

The following narrative provides descriptions for only active contracts in this phase.

Secondary Reactor Batteries A and B (CP-202)

Secondary Clarifier Batteries A and B (CP-203)

Secondary Reactor and Clarifier Battery C (CP-260)

The secondary treatment facility at Deer Island will be a high-purity oxygen activated sludge system. This facility includes selector basins, three secondary reactor batteries (A, B, and C), three secondary clarifier batteries (A, B, and C), a cryogenic oxygen generation system, and a secondary odor control facility. Construction of secondary cross galleries, the secondary operations building, and the waste sludge system are also included in this phase.

Construction of the secondary treatment facilities has been divided into three contracts: Reactor Batteries A and B (CP-202), Clarifier Batteries A and B (CP-203), and Reactor and Clarifier Battery C (CP-260). The Reactor Batteries A and B Phase includes the cryogenic compressor building, two of the three cryogenic generation units, a liquid oxygen storage tank, Secondary Reactor Batteries A and B, the Secondary Odor Control Facility, the Secondary Operations Building, and Reactor Gallery A/B. This phase also includes secondary electrical buildings, portions of the Secondary Cross Galleries, and all the interconnecting piping, electrical, and control systems necessary to make these processes functional.

The contract for Secondary Clarifier Batteries A and B (CP-203) includes construction of two batteries of secondary clarifiers, secondary gallery A/B, return waste sludge pumping facilities, scum facilities, and electrical buildings.

The contract for Battery C (CP-260) includes construction of the final cryogenic generation unit, Secondary Reactor and Clarifier Battery C, secondary odor control equipment, duct work for Battery C, and Reactor Gallery C. Also included are secondary electrical buildings, a stair/elevator building, portions of the Secondary Cross Galleries, and all of the interconnecting piping, electrical, and control systems necessary to make these processes operational.

After passing through the primary clarifiers, wastewater from each of the four primary batteries will flow through an effluent channel into the secondary reactors. The system will utilize flow meters and control valves to distribute flows among the three secondary batteries under normal operating conditions. The system will, however, have the capability to regulate flow to each of the batteries. Once the flow is directed to a battery, it will normally pass sequentially through the selector and clarifier associated with that battery. The system will have the flexibility to transfer or mix flows among secondary clarifier batteries downstream of the secondary reactors.

The selectors will provide a controlled environment whereby organisms that settle well and thus are easily removed in the clarifiers will predominate over poorer settling organisms. The beneficial organisms will thereby be "selected" during this process and harmful organisms will be eliminated.

From each selector, wastewater will flow through a gate to the respective covered secondary reactor, or aeration basin. These reactors will create an environment where oxygen is added for the respiration of the "selected" organisms. The three reactor batteries will be located between the primary clarifiers and the secondary

clarifiers. Each battery will consist of three trains divided into six stages. The first two stages will be designed as selectors that can serve a dual role as additional aerobic basins.

The remaining four stages will serve as oxygen reactor basins. Batteries A, B, and C will be separated by two major north-south galleries, Reactor Galleries A and B and reactor gallery C.

The primary cross gallery will run east-west and separate the secondary reactor batteries from the primary clarifiers to the south. The secondary cross gallery will also run east to west and separate the secondary reactors from the secondary clarifiers to the north. The galleries will provide personnel access and utility routes between adjacent facilities. The cryogenic generation facility will be located east of Primary Clarifier Battery A. The secondary odor control facility will be located in the secondary odor control gallery between Secondary Reactor Batteries B and C. The odor control facility will utilize carbon absorption units. The waste sludge system will consist of the booster pumps and piping necessary to transport excess secondary sludge from secondary treatment to the residuals area for processing.

A cryogenic generator, or cold box, system will supply oxygen to the aeration basins. The cryogenic air separation process will involve compressing and cooling air until liquefaction occurs, removing impurities by low pressure condensation, then separating the oxygen from the air by fractional distillation. The system will be composed of three 150-ton/day cryogenic oxygen generators, a control building to house compressors, air filtering equipment, and electrical equipment. Offices, a control room, an analyzer room, locker rooms, a lunch room, and storage and maintenance areas will also be located at this facility. A cooling system for each generator and liquid oxygen storage space is also included. The transmission of oxygen from the generation area to the reactor basins will be above ground through a looped 18-inch carbon steel pipe.

The effluent from the reactor basins will pass through a shared effluent channel to the secondary clarifiers. In these clarifiers, microorganisms and other suspended matter will settle to the bottom. As in the primary clarifiers, chain and flight mechanisms will collect settled solids and deposit them in common hoppers. Scum will be scraped from the surface of the water and deposited in a scum wet well. Scum from the wet well will be pumped to the residuals treatment facilities.

The secondary clarifiers will be located north of the oxygen reactor batteries and east of the existing North Main Pump Station. To the east, the clarifiers will be bordered by the disinfection basins.

Each battery will consist of 18 sets of stacked clarifiers. Each set will measure approximately 193 feet long by 40 feet wide by 33 feet deep, with the top open to the atmosphere. The total size of each battery will be 1,494 feet long by 193 feet wide.

Two galleries will run north/south between basins A and B and adjacent to basin C. These galleries will measure 1,494 feet in length by 72 feet in width. The galleries will house the Return Activated Sludge (RAS) pumps, associated piping and valves, and controls for sludge transfer from the clarifiers to the anaerobic selectors, with waste sludge to be pumped to the residuals area for further processing.

The scum facilities/pump stations will be located on the east side of Battery A, between Batteries B and C, and on the west side of Battery C. These three structures will house the secondary scum mixers, scum pumps, and associated piping. The scum will be pumped to the Residuals area for processing in the digesters. The pump rooms located on the east and west sides of the secondary batteries will be 34 feet long by 36 feet wide by 32 feet high with 900 square feet of floor space. Attached will be a superstructure with 572 square feet of floor space housing the electrical room, stairs, and scum mixer driver. The facility located between Batteries B and C will be approximately 38 feet long by 31 feet wide by 33 feet high with 1,178 square feet of floor space. This structure will contain the scum pumps, the scum mixer, an electrical room, and stairs.

The addition of a polymer injection system to the secondary clarifiers is necessary to maintain adequate settleability of sludge. An interim liquid emulsion polymer system will be installed within the existing space of the secondary odor control facility to meet the initial needs of batteries A and B. A new dry polymer system will be installed between batteries B and C and will ultimately serve all three secondary batteries allowing more flexibility in choice of polymers and efficiency of system. The system will supply between 4000 lb/day and 20,000 lb/day of polymer dosage to the secondary clarifier system.

The electrical/stair facilities will be located on the roofs of the secondary galleries running between Batteries A and B and adjacent to Battery C. These facilities will contain a unit substation, motor control centers to power and operate the clarifiers, return sludge pumps and associated equipment. Each gallery will include two buildings which will occupy 3,520 and 3,014 square feet, respectively.

Disinfection Facilities Phase I/Seawall (CP-204)

Disinfection Facilities Phase II/Hydroelectric Plant (CP-241)

Disinfection Facilities Phase III (CP-242)

The disinfection facilities were to be built in three phases to allow for early construction of the process system, half of the chemical storage, and the disinfection facilities needed to operate new primary clarifier Batteries A and B.

However, it has been determined that the third phase of this contract is no longer needed and therefore it has been eliminated from the final FY97-99 CIP.

The design criteria for the disinfection basins has been reevaluated in light of the additional detention time that will take place in the new outfall, resulting in a reduction in the number of disinfection basins from four to two.

The Deer Island Disinfection Facilities will be located south of the effluent outfall tunnel shaft and east of Secondary Clarifier Battery A. These contracts include disinfection basins, plant process water pumps, chemical storage facilities, a disinfection gallery, an electrical building, and two low head turbine generators.

As originally planned, the chlorine disinfection basins will consist of a serpentine channel making three-passes, each 500 feet long, with an overall width of approximately 180 feet for the two basins. The two disinfection basins were designed to provide for disinfection of primary and/or secondary effluent at the peak flow of 1,270 mgd.

The chemical storage facilities will consist of six 250,000 gallon tanks and associated equipment for the storage and distribution of sodium hypochlorite and sodium bisulfite. These facilities will be located on the south side of the Disinfection Gallery. Three of the tanks will be used for hypochlorite storage, two for bisulfite storage, and one as a standby storage tank for either of the two chemicals.

Provisions for both barge and truck delivery of the two chemicals are included in these contracts. Barge delivery are the primary method of delivery due to the large volume of chemicals required and the mitigation agreement with the Town of Winthrop. Sodium hypochlorite solution will be pumped to the storage facility from barges at the pier facilities through two eight-inch PVC pipes. Similarly, sodium bisulfite solution will be pumped to storage through two eight-inch PVC pipes. Sections of the four PVC pipes that are installed underground will be laid in concrete pipe chases.

An 84 feet long by 180 feet wide disinfection gallery, containing process equipment and piping, is located between the disinfection basins and the tank storage area. An electrical building is located on top of the disinfection gallery. This gallery will house the plant water pumps. The plant water pumps will draw secondary effluent from the disinfection basins. The secondary effluent will be used as non-potable process water throughout the new plant.

A hydroelectric power facility will be constructed and powered by effluent flows from the disinfection facility. The facility will consist of two turbines with a maximum capacity of 2,000 kilowatts. These turbines will be housed in a deep concrete structure, located in the bypass conduit between the disinfection basins and the outfall shaft. Control systems will automatically adjust the units for changing effluent flows, and shut down the turbines and bypass the flows in the event of a problem with the hydropower equipment.

This hydroelectric power facility will produce an average of 1,400 kilowatts of electric power per hour resulting in the production of more than 12 million kilowatt hours per year. Electricity will be fed to the 13.8 kilovolt power distribution system for use on Deer Island.

The portion of the seawall that replaces the existing seawall will also be constructed under this phase. The area covered will be from the new Resthaven Cemetery to the south end of the existing seawall, approximately 2,600 feet.

Ancillary Deer Island Modifications Phase II (CP-210)

Ancillary Deer Island Modifications Phase III (CP-211)

Ancillary Deer Island Modifications are improvements that, during the design review process, were suggested as revisions to the proposed design. Possible reasons that these items were not included in the original design documents are that they were suggested too late in the design development or that they may not have become apparent until plant staff actually began the operation. Whatever the reason, the Program Management Division (PMD) groups these items either into separate new construction contracts or packages them with other planned contracts.

Approximately 50 individual scope items will be packaged together and bid into CP-210 and CP-211, the second and third phases of Ancillary Deer Island Modifications. These scope items include mostly engineering and electrical modifications, plant modifications, and demolition of construction support facilities.

Effluent Outfall Tunnel (CP-282)

The outfall tunnel will discharge treated effluent from the Deer Island Plant east/northeast into Massachusetts Bay. This phase includes construction of a vertical access shaft at Deer Island and the effluent outfall conduit, excavation of the outfall tunnel, lining of the tunnel with precast concrete panels, connection of the tunnel to the vertical riser shafts installed by CP-283, and transport of tunnel spoils to processing sites on Deer Island. The total length of the outfall tunnel including the portion below the diffusers is 9.5 miles. The finished diameter of the tunnel will be 24.25 feet.

The outfall shaft consists of a 30-foot diameter vertical shaft approximately 440 feet deep. The effluent outfall conduit will carry the flow from the disinfection basins to the outfall shaft. With the exception of the upper 110 feet of the Deer Island shaft and effluent outfall conduit, all excavation is expected to be in rock by driving the tunnel boring machine through the tunnel on a straight grade up from the Deer Island shaft to the diffuser area.

Effluent Outfall Project Tunnel Muck Processing and Disposal (CP-285) **Effluent Outfall Project Tunnel Muck Processing and Disposal II (CP-286)**

These contracts provide for processing 1.7 million tons of tunnel muck for reuse as select backfill and for other purposes. These contracts also provide for disposal of excess muck totaling approximately 2.3 million tons. The barge loading site for transport to an off-island disposal site is located adjacent to the concrete batch plant and the processing site is located on a platform prepared under the contract for disposal of excess till (CP-030).

On-Island Residuals Construction

Purpose

This phase includes contracts for construction of facilities required for residuals handling on Deer Island, which will consist of sludge thickening and anaerobic digestion. Separate primary and secondary sludge thickening facilities are being constructed in this phase. Primary sludge will be thickened in gravity thickeners while secondary sludge will be thickened using solid bowl centrifuges. The total cost of On-Island Residuals construction is estimated to be \$311.4 million.

The residuals facilities' operation building will be located in the Operations and Odor Control Center during the interim period when only Residuals 1-A/1-B (CP-301) are on-line. The Operations and Odor Control Center facility is a 190-foot long by 159 foot wide by 56 foot high, four-level, reinforced concrete building. The final location for the permanent operations center will be in the Centrifuge Building.

Expenditure Forecast and Schedule

Construction Package	Contract	Total Contract Amount (\$000)	Begin date	End date
CP-301 (complete)	Res Treatment Fac Ph I Primary A, B, C, &D	\$213,717	Aug 91	Dec 95
CP-303	Res Treatment Facility Phase I Secondary A & B	\$97,720	Oct 93	Jun 97
	TOTAL:	\$311,437		

Residuals Treatment Facilities Phase I Secondary Batteries A and B CP-303)

A digester module will be constructed to process the additional quantities of residuals from Secondary Clarifier Batteries A, B, and C. A centrifuge facility is being built to thicken waste secondary sludge as well as processed sludge. Twelve centrifuges will handle secondary waste sludge, while the remaining four will thicken combined sludge after digestion. The centrifuge facility will consist

of a 202-foot long by 148-foot wide by 57-foot high, reinforced concrete building with four levels. The underground gallery network will be expanded to encompass these facilities. The odor control system duct and equipment will also be expanded. This building will also contain polymer feed systems, auxiliary equipment, and sludge conveyance equipment. Facilities and equipment for handling thickened secondary sludge, returning concentrate to the liquid treatment train, and centrifuge wash water will also be provided.

Permanent Utilities Construction

Purpose

This phase will provide the utilities necessary to construct and run the new Deer Island Treatment Plant. Included in this phase are contracts to provide water utility lines through Winthrop (CP-401), yard utilities including permanent distribution lines for electric power and a permanent switchgear facility (CP-427/402), a thermal/power plant (CP-428) to provide required heat on the island, and combustion turbine generators (CP-431). Process instrumentation and control systems (CP-450), a facility information system, and a plant personnel protection system (CP-452) are being implemented as part of this phase to provide process and administrative information to all supervisory and operational personnel. The total cost of Permanent Utilities Construction is estimated to be \$187.1 million.

Expenditure Forecast and Schedule

Construction Package	Contract	Total Contract Amount (\$000)	Begin date	End date
CP-401 (complete)	Off-Island Water Line	\$16,174	Jan 93	Nov 95
CP-427 (complete)	Mn 13.8 Switchgear, Bldg, & Distribution/Yd Utilities	\$21,245	Jul 91	Mar 95
CP-428	On-Site Power Plant	\$75,431	Jan 93	Feb 97
CP-431 (complete)	BEC Co CTG	\$34,365	Jan 94	May 95
CP-450	Instrmt & Ctrl Ph I	\$21,018	Jan 93	Oct 99
	Facility Info System	\$6,462	Jan 93	Aug 97
CP-452	Plant Comm System	\$12,369	Jan 93	May 99
	TOTAL:	\$187,064		

The following narrative provides descriptions for only active contracts in this phase.

On-Site Thermal/Power Plant (CP-428)
BECo Combustion Turbine Generators (CP-431)

An on-site oil-fired power and gas-fired thermal plant is being constructed on Deer Island. This contract includes construction of the building that will house the turbine and thermal plant, construction of thermal facilities, and provision of fuel oil storage tanks.

The existing submarine cable to Deer Island is intended to serve as the primary source of electric power for the new treatment plant. The power plant is intended as a back-up source of electric power in the event that there is an interruption of the primary supply. According to the Environmental Protection Agency (EPA) mandate, the plant must be able to withstand such an interruption and still provide at least primary-level treatment of the full design flow. This requirement was set forth in the Secondary Treatment Facilities Plan.

It is anticipated that two oil-fired combustion turbines, a steam turbine driven by the new boilers, in combination with existing on-island diesel generator capacity, will be needed in the power plant to meet the estimated electric load requirements.

The building housing the power plant is being designed with the flexibility to meet future contingencies including a change in purchased power costs, which would make it cost effective for the MWRA to generate its own primary power supply; improved markets for power and/or capacity sales; and a possible future need for additional power. The design of the building will facilitate plant expansion to either a primary source of power for the island, or into a larger backup source, as future needs dictate. Such changes to the power plant would require a new air quality permit.

The thermal plant will include two boilers, a steam turbine, and a condensing heat exchanger to provide high temperature hot water for the central plant heating system for the new treatment plant buildings and process. The thermal plant boilers will be fired with digester gas, supplemented by fuel oil. Digester gas will be treated to remove hydrogen sulfide before being burned. This will limit emissions to acceptable levels.

The thermal plant and the power plant will be contained within a single building. The fuel oil storage tanks will be located to the north of the facility, on the other side of the perimeter road.

Process Information and Control System (CP-450)

The Process Information Control System (PICS) contract is the plant-wide computer-based system on Deer Island which controls the entire treatment process. The PICS hardware is distributed throughout virtually every facility and is anchored by a series of area control centers. Communication flows are controlled through a network of conduit, junction boxes, wireways, and duct banks. PICS also subsumes the Facility Information System network which links the Deer Island Treatment Plant computer system to the Charlestown Navy Yard computer network. This system generates plant operations reports and maintains an extensive plant inventory database.

Facility Information System

The Deer Island treatment plant utilizes a Facility Information System (FIS) to provide operations and maintenance management tools for supervisory staff. The FIS connects with the Authority's existing management information systems, with the additional hardware, software, and programming needed for Deer Island to be provided through this contract.

The FIS includes an Operations Management System (OMS) with a Plant Operations, NPDES reporting application, and a Laboratory Information Management System (LIMS). The Plant Operations and NPDES reporting application provide managers and supervisors with routine operational and compliance reports and process trend information for use in evaluating operational efficiency. The LIMS provides services to meet the laboratory needs for Deer Island process control, NPDES programs, residuals, harbor studies, TRAC, CSOs, off-island residuals, and air monitoring.

Also included in the FIS contract is a Maintenance Management System (MMS), which provides preventive and corrective maintenance scheduling capabilities and management functions, historical analysis for assessing and improving maintenance and cost, and inventory management of materials. The MMS will interface with Materials Management, Purchasing, Technical Information Center, CADD/DP, Scheduling, and Safety applications systems.

FIS covers administrative applications for safety management, and supporting hardware and data networks. The Facilities Information System contract is managed by the Sewerage Division.

Personnel Protection System (CP-452)

The Personnel Protection System (PPS) contract is comprised mostly of the island-wide fire system, which includes fire detection and suppression capabilities and will automatically alert island staff and the Boston and Winthrop Fire Departments as the situation dictates. PPS also includes the Private Branch Exchange telephone system; the page/party system, a network of handsets and speakers; the card access system, designed to limit access to specific plant areas; and the closed circuit television monitoring system which provides visual surveillance in key areas.

Construction Support Services

Purpose

Construction Support Services contracts provide temporary buildings and utilities, roadway maintenance, rodent control, trash removal, security, and other facilities and services necessary to support the construction effort for the Boston Harbor Project. Providing centralized support facilities and services avoids potential coordination problems which could occur if contractors were responsible for their own utilities, transportation, and maintenance. The total estimated cost of the 45 construction support services contracts is \$75.4 million.

Expenditure Forecast and Schedule

Construction Package	Contract	Total Contract Amount (\$000)	Begin date	End date
	Technical Assistance	\$374	NA	NA
	Construction Power	\$7,511	Jan 90	Dec 99
(complete)	Construction Water	\$1,997	Jul 91	Jan 95
	Interim Utilities	\$1,001	Oct 94	Sep 96
CP-901 (complete)	Constr Support Bldg	\$4,067	Sep 90	Jul 91
CP-902 (complete)	Constr Road & Utilities	\$5,153	Nov 90	Jan 92
CP-903 (complete)	Fuel Facility	\$1,665	Oct 90	Sep 91
CP-904 (complete)	Fuel Supplier	\$126	Jul 90	May 92
CP-920	Fuel Supplier Phase II	\$50	Jun 92	May 96
CP-924	Fuel Supplier Phase III	\$44	Jul 96	Jun 98
CP-909 (complete)	Security	\$198	Oct 89	Oct 90
CP-917 (complete)	Security Phase II	\$1,196	Nov 90	Dec 92

CP-930 (complete)	Security Phase III	\$1,233	Dec 92	Dec 94
CP-935	Security Phase IV	\$1,686	Jan 95	Dec 96
CP-942	Security Phase V	\$2,233	Feb 97	Mar 00
CP-910 (complete)	Site & FRSA Maint	\$1,898	Oct 90	Nov 92
CP-931 (complete)	Site & FRSA Maint	\$2,476	Nov 92	Nov 94
CP-936	Site & FRSA Mnt Phase III	\$3,538	Nov 94	Nov 96
CP-943	Site & FRSA Mnt Phase IV	\$4,316	Nov 96	Dec 98
CP-911 (complete)	Trash Disposal	\$852	Jul 90	Jul 93
CP-933 (complete)	Trash Disposal Phase II	\$954	Jun 93	Jun 95
CP-938	Trash Disposal Phase III	\$852	Jul 95	Jul 97
CP-944	Trash Disposal Phase IV	\$808	Jun 97	Dec 99
CP-912 (complete)	Off-Site Mnt&Hskp	\$205	Dec 90	Jan 93
CP-934 (complete)	Off-Site Mnt&Hskp II	\$315	Feb 93	Feb 95
CP-939	Off-Site Mnt&Hskp III	\$441	Feb 95	Feb 97
CP-945	Off-Site Mnt&Hskp IV	\$496	Dec 96	Dec 99
CP-950 (complete)	Constr Sup Labor	\$735	Aug 91	Aug 92
CP-951 (complete)	Constr Sup Labor-II	\$3,992	Aug 92	Jul 93
CP-952 (complete)	Constr Sup Labor III	\$5,855	Jul 93	Jul 95
CP-953	Constr Sup Labor IV	\$5,796	Aug 95	Jul 97
CP-954	Constr Sup Labor V	\$2,500	Aug 97	Jul 99
	Construction Services	\$2,000	Aug 95	Sep 96

CP-960 (complete)	Const Sup Lab - Elect	\$909	May 93	May 95
CP-961	Const Sup Lab - Plumb	\$594	Jul 94	Jul 96
CP-962 (complete)	Const Sup Lab HVAC	\$429	Apr 94	Apr 96
CP-963	Const Sup Lab II-Elect	\$994	Jul 95	Dec 96
CP-964	Const Sup Lab II-Plum	\$1,000	Jul 96	Jun 99
CP-965	Const Sup Lab II HVAC	\$992	Mar 96	Apr 99
CP-968	Const Sup Lab III-Elect	\$1,794	Jan 97	Dec 99
CP-922 (complete)	Ofst Snow&Asph Swp	\$134	Oct 90	Nov 92
CP-932 (complete)	Ofst Snow&Asph SwpII	\$589	Nov 92	Dec 94
CP-937	Ofst Snow&Asph Swp III	\$610	Jan 95	May 97
CP-946	Ofst Snow&Asph Swp IV	\$621	Nov 96	Dec 99
CP-913 (complete)	Rodent Control	\$34	Jul 89	Jul 91
CP-919 (complete)	Rodent Control II	\$133	Sep 91	Sep 95
CP-947	Rodent Control III	\$41	Sep 95	Dec 99
	TOTAL:	\$75,437		

The following narrative provides description only for active contract in this phases.

Construction Power

Each construction contractor operating on the island requires electricity to operate equipment, and for other purposes. The MWRA pays directly for the power consumed during the course of construction, resulting in lower overhead costs.

Construction Water

The Authority pays directly for water required by the construction contractors.

Interim Utilities

The thermal plant (CP-428), which will provide heat for the new plant, was not available to support the start-up of the first two batteries of primary treatment. Temporary boilers and generators were installed to provide heat and thermal energy until the permanent thermal plant is operational in early 1996.

Fuel Supplier I (CP-904)

Fuel Supplier II (CP-920)

Fuel Supplier III (CP-924)

Approximately one million gallons of fuel was consumed on Deer Island per year during the period of peak construction (1993 - 1994) and a significant volume of fuel will be required throughout the duration of the project. The first fuel supplier contract (CP-904) provided fuel to BHP contractors on Deer Island from an interim fuel facility (1990-1992). In mid-1992 the CP-920 Fuel Supplier II contractor commenced a four-year contract (1992-1996) to supply fuel to Boston Harbor Project contractors, the construction support building, the Deer Island treatment plant buildings and vehicles, and to collect and remove used motor oils, hydraulic oils, and oil filters from contractors. CP-920 Fuel Supplier II provides the service using the newly constructed Deer Island Fuel Facility and its own vehicles for on-island distribution of diesel fuel. CP-924 Fuel Supplier III will provide this service for the duration of the project (1996-1999).

Security I, II, III, IV, and V (CP-909, 917, 930, 935, and 942)

During the course of construction there will be 25 to 35 field office trailers throughout Deer Island and Nut Island which will contain office supplies and valuable equipment. There will also be equipment maintenance areas and small tool sheds that will contain expensive supplies.

To coordinate provision of security services, a centralized security system has been established. This system consists of five stages. The first stage involved a one-year contract (CP-909) to develop the overall security system plan. The second stage (CP-917) expanded the security system plan developed in stage one and provided security for two years ending December 1992. The third stage (CP-930) provided security services for two years ending in December 1994. The fourth phase (CP-935) commenced in 1994 and extends for two years ending

December 1996. The fifth phase (CP-942) will commence in 1996 and extends for the duration of the project.

The security contracts provide for security personnel stations and mobile patrols for Deer Island, Nut Island, the Suffolk Downs Bus Transportation Parking Facility, and the Squantum Point Water Transportation Parking Facility. Security headquarters is located on Deer Island. The contracts include provision for maintenance of project security records and investigation and reports of security and fire incidents at any of the sites described above.

Site and FRSA Maintenance I, II, III, and IV (CP-910, 931, 936, and 943)

Temporary construction roadways and sanitary facilities must be maintained for the duration of BHP construction. Three contracts are required to provide this long-term maintenance. Services for the first two years (1990-1992) were provided through CP-910, services for the next two years (1992-1994) were provided through CP-931, services for the next two years (1994-1996) are being provided through CP-936, and services thereafter (1996-1999) will be provided through CP-943. The services provided under these contracts include the following:

- Required snow plowing and removal, and salt and sand spreading at FRSA and Deer Island.
- Maintenance of access roads, drainage systems, and common areas at Deer Island.
- Dust control for access roads and common areas at Deer Island.
- Street sweeper operation at FRSA, Deer Island, and Point Shirley.
- Single-unit portable toilets at Deer Island.
- Sewage holding tank pumping service and janitorial service for site toilet buildings on Deer Island.
- Monitoring of the trash facility and moving of 70-cubic yard trash trailers to and from the RO/RO pier on Deer Island.
- 55-gallon steel drum trash containers at FRSA and Deer Island.

- Common area cleanup services at FRSA and Deer Island.
- Miscellaneous cleanup services at Deer Island.

Trash Disposal Deer Island/FRSA (CP-911)

Trash Handling and Disposal II (CP-933)

Trash Handling and Disposal III (CP-938)

Trash Handling and Disposal IV (CP-944)

During the course of construction at Deer Island and the FRSA, there will be construction debris and non-hazardous solid waste which must be collected and disposed of properly. The trash contractors contain, haul, and dispose of non-hazardous solid waste and construction debris at an approved disposal site. These services were provided through CP-911 for the first three years (1990 to 1993), through CP-933 for the next two years (1993 to 1995), through CP-938 for the next two years (1995 to 1997), and will be provided through CP-944 thereafter (1997 to 1999).

The trash contractors are responsible for maintenance, inspection, and supervision of trash disposal equipment, services, and operations. All Deer Island trash trailers utilize the roll-on roll-off ferry.

**Off-Site Maintenance and CSB Housekeeping I, II, III, and IV
(CP-912, 934, 939, and 945)**

**Off-Site Snow Related Service and Asphalt Sweeping I, II, III, and IV
(CP-922, 932, 937, and 946).**

There are several off-site facilities that support construction at Deer Island and Nut Island which must be maintained. The facilities at Suffolk Downs, Mystic River, and Squantum Point require janitorial services, general cleanup, site maintenance, and landscaping maintenance. The Construction Support Building on Deer Island also requires janitorial services. In addition, these sites require snow removal and asphalt sweeping. These phases are being provided in three stages. The initial janitorial services, general cleanup, and landscape maintenance services were provided by CP-912, while CP-922 provided the road/parking lot snow service and asphalt sweeping. These services were provided through CP-932 and CP-934 through the end of 1994, and are being provided through CP-939 and CP-937 for the next three years (1995-1997). Hereafter (1997-1999), the services will be provided through CP-945 and CP-946.

Construction Support Labor Phase IV and V (CP-953 and 954)

The construction support labor contractor provides construction, reconstruction, renovation, reconditioning, installation, repair, and testing of construction support facilities and systems. Work is performed on an as needed basis under work orders as directed by the Construction Manager (CM). Services may be performed at Deer Island, Nut Island, and all support and transportation sites. This may include work on the existing Deer Island Treatment Plant required due to construction. The first three phases of this contract (CP-950 from 1991-1992, CP-951 from 1992-1993, and CP-952 from 1993-1995) are complete. From 1995-1997 services are being provided through CP-953, and from 1997-1999 services will be provided through CP-954.

Construction and Design Services

Construction and Design Services cover those items that cannot be contractually added to existing construction packages. These include items identified during review programs, such as "Will it Work" and System Integrity. The funding for the design of repairs to existing outfall 002 is also included.

Construction Support Labor - Electrical I, II, & III (CP-960, 963, & 968) Construction Support Labor - Plumbing I & II (CP-961 & 964) Construction Support Labor - HVAC I & II (CP-962 & 965)

The Chapter 149 construction support labor contracts provide building construction, reconstruction, renovation, remodeling, installation, repair, and testing of construction support buildings. Separate concurrent contracts are provided for electrical, plumbing, and HVAC work. Work is performed on an as needed basis under work orders as directed by the CM. Services may be performed at Deer Island, Nut Island, and all support and transportation sites. This may include work on the existing Deer Island Treatment Plant required due to construction. CP-960, 961, 962 and 963 provided services through 1996. Thereafter, through 1999, services will be provided under CP-964, 965, and 968.

Rodent Control I (CP-913) Rodent Control II (CP-919) Rodent Control III (CP-947)

A three-stage rodent control approach has been adopted for Deer Island. The first stage was a two-year contract (1989-1991) that preceded the Site

Preparation I construction contracts. The goal was to eliminate as many rodents as possible before disrupting their natural habitats and to mitigate potential migration of rodents to public areas and abutting properties. The contractor furnished all labor, equipment, material, and supervision to perform a comprehensive and complete rodent control program. The second stage was a four-year maintenance program (1991-1995) to control rodents during the balance of major excavation on the island, including the period of time prior to and during demolition of the House of Correction. A third phase is included for control beyond 1995.

Construction Management

Purpose

This phase consists of contracts required to effectively support and manage the construction of the new treatment plant and residual facilities. The provision of consultant services for program and construction management, as well as facilities and job training are included. The phase also includes an insurance program and start-up services. The total cost of Construction Management services is estimated to be \$351.3 million.

Expenditure Forecast and Schedule

Contract	Total Contract Amount (\$000)	Begin date	End date
P/CM Services	\$18,354	Apr 88	Jun 91
CM Services (90-98)	\$247,200	Aug 90	Dec 98
CM Services (99-2004)	\$15,532	Jan 99	Dec 04
Facilities Training	\$3,575	Jul 90	Jun 00
Project Offices	\$6,083	Jul 88	Jun 98
Mgmt Support Services	\$505	Jul 88	Jul 90
Consultant Computers	\$600	Nov 88	Sep 95
Job Training	\$2,392	Jul 90	Sep 93
Legal Lien Fees	\$63	Jan 89	Jun 93
Professional Services	\$4,992	Oct 89	Jun 00
Insurance Gen Liab	\$3,246	Jan 90	Jun 00
Insurance Builders Risk	\$5,839	Jan 90	Jun 00
Insurance Marine Liab	\$1,152	Jan 90	Jun 00
Risk Management	\$922	Sep 88	Dec 99
Labor Agrm. Admn. Serv	\$3,078	Jan 90	Jun 00

Permit Fees	\$707	Jan 90	Dec 99
Outfall Admin	\$3,017	Aug 90	Jun 97
Outfall Permits	\$100	Jul 90	Jan 98
Outfall Start-up	\$10,000	Jan 98	Aug 98
Winthrop Easements	\$1,000	Jan 93	Mar 94
Building Permits	\$3,500	Jul 91	Jun 98
Misc Facility Support	\$3,466	Sep 91	Jun 00
Winthrop Road Reconst	\$1,602	NA	NA
MBE/WBE Assistance	\$250	Jul 96	Dec 96
Construction Safety	\$1,809	Apr 92	Jun 99
FO/RO-Rolling Stock	\$4,810	Mar 93	Jun 99
FO/RO-Furnishings	\$1,713	Mar 93	Jun 99
FO/RO-Shop & Mnt Equip	\$1,770	Mar 93	Jun 99
FO/RO-Lab Equipment	\$2,526	Mar 93	Jun 99
FO/RO-Audio/Vis Supplies	\$158	Aug 93	Jun 99
FO/RO-Misc. Fit Out Supplies	\$1,377	Mar 93	Jun 99
TOTAL:	\$351,338		

Program/Construction Management (P/CM) Services

The P/CM provided primary day-to-day program management for the project during the pre-construction period from April 1988 to December 1990. Program management included constructability, review of design, oversight of cost estimating, program coordination and scheduling, community relations, permitting, water transportation, bulk materials handling, value engineering, prepurchase of equipment and materials, construction planning, facility testing, start-up, and staff training. In addition, the P/CM provided technical support for agency decisions regarding contractor selection, change order control, progress payments, and final acceptance.

Construction Management (CM) Services I Additional Resident Inspection (1990-1998)

The MWRA awarded the contract for Construction Management Services to ICF Kaiser Engineers Massachusetts, Inc. (ICF-KE). There was a six-month transition period between the P/CM and CM contracts, from July 13, 1990 to December 31, 1990. The MWRA has 3 three-year options to extend the original CM contract (1990-1995). The extension to the current contract, referred to as Phase II, is for services through the period of January 1996 through December 1998. The two CM line items, (1990-1995) and (1996-1998), have been combined into one line item (1990-1998) in the FY97-99 CIP for budgeting purposes.

The CM is responsible for all Boston Harbor Project construction management and support activities through the end of the project. The CM team provides services in program support, construction management, and quality assurance/quality control.

Program support includes project management, project controls, information systems, contracts management and administration, project promotion, risk management, and job training.

Construction management includes those services directly related to the management and support of all Boston Harbor Project construction activities. The CM provides construction and site management, resident engineering and inspection services, contract bid support, logistical management, industrial relations, safety management, substance abuse prevention, and facilities management and support of Deer Island construction facilities. Other services include engineering support and coordination with design engineers during construction and start-up phases of the project, shop drawing administration, record drawings, operational support, and management of a limited number of design activities.

Quality assurance/quality control includes the development and management of an overall program to assure and control quality. The CM also provides design review services in constructability, operability, and value engineering areas. Survey and field coordination, regulatory support, mitigation compliance, and environmental compliance services are also provided by the CM.

Construction Management (CM) / Additional Resident Inspection Services (1999-2004)

The option to extend this contract again may be utilized as additional CM and resident engineering and inspection services may be required which are not part of the scope of services currently being provided by the CM.

Facilities Training

Facilities training is the training and assistance required to operate the new treatment plant and laboratory, and to meet all state and federal performance standards. Approximately 500 treatment plant and laboratory employees, and 21 Nut Island Headworks employees were trained under this phase. These staff are learning to operate the new plant equipment and facilities in accordance with standard operating procedures, and to manage and administer the plant safely and efficiently. Training is also being provided for the facility information system and the technical laboratory.

Project Office

The project offices for the Construction Manager and the Lead Design Engineer are located at the Schrafft's Center in Charlestown, the Fore River Staging Area, Deer Island, Nut Island, Suffolk Downs, and Squantum Point, and provide space for 300 to 350 personnel. The budget for these offices includes estimated charges for telephone services, copying equipment, leases, and utilities.

Management Support System (MSS)

The Management Support System is comprised of hardware, software, and support services to facilitate project management of all Deer Island construction and design activities. The project management, information management, and data/statistical analysis functions provide the ability to control costs and schedules and to facilitate access to information.

Consultant Computers

This contract includes provision of computer support and tools for the project on an as needed basis. These support tools include hardware, maintenance, database, automated desktop tools, desktop publishing, network support, and graphics software packages.

Job Training

A comprehensive, multi-phased training program has been designed and implemented for the staff at Deer and Nut Island facilities. The purpose of this training is to prepare the current work force for complex, technical jobs in the new plant and to provide essential preparation for plant-specific facilities training.

Additional training activities are designed to prepare women and minorities to enter apprenticeship programs and qualify for construction jobs; to introduce women and minorities to careers in environmental planning, design, engineering, and construction management; and to recruit and prepare Winthrop residents for jobs at the new plant.

Legal Lien Fees

This item provides funds in support of easements, title searches, and other associated costs related to the installation of the water line through Revere, Chelsea, and Winthrop.

Professional Services

This line item provides or has provided for the following services:

- Economic Impact Analysis
- Winthrop Roads Consultant
- Appraisal Services
- Bus Route Consultant
- Suffolk County House of Correction Memorandum of Understanding
- Printing of Bid Specifications
- Office Trailers
- Miscellaneous Professional Services

Risk Management Program

The main objectives of the Risk Management Program are to protect the assets and financial well-being of the Authority, to achieve optimum contractor responsibility and accountability, and to minimize the overall cost of the program.

The major components of the Risk Management Program are risk control and insurance. The risk control program includes a safety program, which includes

the development of a safety manual, mandatory training by contractors of all staff working at the construction site, and creation of an executive committee comprised of MWRA and CM personnel to ensure that the program is comprehensive and effective. Risk control also includes a risk transfer program with commercial insurance and risk sharing provisions, such as contractors contractually sharing in the deductible portions of insured property losses. The risk control program also includes a reserves program, which established a fund to protect the MWRA from non-insured losses. Contractually, contractors and consultants are required to provide certain insurance which may include Workers' Compensation, General Liability, Marine Liability, and Automobile Liability Insurance.

Excess General and Excess Marine Liability

The purpose of excess general and marine insurance is to provide adequate coverage for the MWRA in case of catastrophic occurrences. Construction contractors are required to provide basic general liability insurance. The personnel and materials transport operators as well as contractors with marine operations are required to provide \$5 million of marine insurance. The excess general and marine liability program provides coverage for the MWRA and the construction manager.

Builder's Risk Insurance

The purpose of Builder's Risk insurance is to provide coverage in the event of property losses during construction of the Boston Harbor Project. Builder's Risk insurance provides coverage for the MWRA as well as BHP construction contractors for materials and equipment either stored at the site, at approved off-site locations, or in transit to the site. In order to keep the insured contractors responsible and accountable, the MWRA has structured a deductible program whereby construction contractors are responsible for the first 50% of applicable deductibles.

Labor Agreement Administration Services

The Boston Harbor Project Labor Agreement (BHPLA) was established to ensure labor harmony and stability among the various skilled trade organizations and contractors throughout construction of the new treatment facilities. The BHPLA supports timely and successful completion of the treatment facilities by providing efficient dispute resolution mechanisms to resolve grievances without work slowdowns or stoppages. On March 8, 1993, the U.S. Supreme Court ruled unanimously in favor of an appeal sought by the MWRA and the AFL-CIO

upholding the legality of the agreement. The Court's ruling re-affirmed the original ruling by the Federal District Court and overturned rulings by the First Circuit Court of Appeals. The Supreme Court gave local agencies, including the MWRA, the same right private property owners already had to impose uniform labor agreements on all contractors in large projects.

Permit Fees

This line item includes fees for environmental permit acquisition and inspections for the following permit related activities:

- Hazardous Waste Oversight
- Air Quality Plans Approval
- Hazardous Waste Compliance Inspection
- Water Cross Connection Compliance
- Groundwater Discharge Compliance
- Registry of Deeds (Permit Recording Fees)
- Marine Oil Terminal
- National Pollution Discharge Elimination System
- Annual DEP Compliance
- Newspaper Advertisements
- Wetlands Protection Act Application
- DEP Water Quality Certifications
- DEP Chapter 91 Waterways Applications

The Commonwealth of Massachusetts recently enacted a new fee structure for Wetlands Protection Act permit applications. In the past, a standard \$25 fee was required for a Notice of Intent for any project. Now the fee is calculated based on the type of work and its location with reference to specific natural coastal resources, such as a beach or bank. Application fees now range from \$50 to \$10,000 per project.

Outfall Administration

In order to facilitate the construction of the effluent outfall tunnel and diffusers, a Disputes Review Board (DRB) was established. This board ensures equitable and timely resolution of all disputes between the MWRA and the contractors building the effluent outfall tunnel and diffusers. The Outfall Administration contract provides the administrative and legal services required for the DRB.

Outfall Permits

The State Department of Public Safety may require the MWRA to pay for a permit for the effluent outfall tunnel. This item has been budgeted to cover the cost of the potential permit and is still under review.

Outfall Start-Up

The current outfall construction contract will end when the tunnel construction is complete and the tunnel is filled with chlorinated seawater. The outfall must then be "started up" which will include beginning flow through the tunnel, removal of the diffuser caps, and fine tuning of the system for proper operation. The start-up contractor will perform services necessary to accomplish this task.

Winthrop Easements

This contract covers any easements and land purchases required for routing the utility lines (CP-401) through Winthrop.

Building Permits

The MWRA must acquire building permits for any buildings or structures under the jurisdiction of the state building code. Most BHP contracts include construction of public buildings which require building permits. The Department of Public Safety's review and permitting process ensures the structural integrity and safety of the buildings and structures. State law requires the payment of a fee to the department.

Miscellaneous Facilities Support

This contract includes repair of city streets and private roads in Quincy and police detail at Revere Sugar and Squantum Point. Additional traffic signals at FRSA, safety and emergency services in Winthrop, and the Belle Isle Marsh Study are also included.

MBE/WBE Assistance

The MWRA has established a professional services contract with a consultant to provide pre- and post-contract award technical assistance services to minority business and/or women business enterprises (MBE/WBE).

Construction Safety

An Emergency Tunnel Response Team and a safety consultant to review the Boston Harbor Project safety program are provided through this contract.

Fit-Out

Fit-Out is the program which provides non-construction related items necessary for start-up and operation of the new treatment plant. This program is categorized by specific line items including rolling stock, furnishings, shop and maintenance equipment, laboratory equipment, audio-visual supplies, and miscellaneous consumable supplies, each with a detailed description below.

Initially, fit-out plans at similar facilities in Washington D.C., Detroit, Baltimore, and Minneapolis/St. Paul were evaluated and adapted to Deer Island facilities based on the Plan of Operations. Industrial engineering and value engineering reviews were conducted on the initial estimates. The overall focus of these reviews was to consolidate, not only as a cost saving measure, but also to conserve space. The proposed equipment has been specified based primarily on function, durability, and life cycle value. All Fit-Out items are competitively procured by the MWRA.

Fit-Out - Rolling Stock

Rolling Stock includes all mobile plant equipment, such as pick-up trucks and cranes, industrial tricycles for journeymen, and mobile pumps for cleaning and maintenance.

Fit-Out - Furnishings

Furniture quantities are based on the Deer Island staffing plan in which offices, work stations, and maintenance shops are provided with desks, chairs, tables, shelving, and other required furniture. Furniture is specified for durability, flexibility, and strength.

Fit-Out - Shop and Maintenance Equipment

This category of Fit-Out is for the purchase of machinery, lathes, drill presses, and other equipment to maintain the new plant. Equipment specifications are based on durability and ease of use, and are designed to accommodate process equipment items specified for Deer Island.

Fit-Out - Laboratory Equipment

This category of Fit-Out/Rolling Stock is for the purchase of analytical and support equipment to test the various treatment plant processes to demonstrate compliance with the effluent discharge permit. Additional laboratory equipment has been purchased for central wastewater testing needs previously provided by private laboratories at an approximate annual cost of \$3 million.

Fit-Out - Audio-Visual/Supplies

This category of Fit-Out/Rolling Stock is for the purchase of dry marker boards, overhead projectors, and other supplies to support training of plant staff. In addition to overhead and slide projectors, video recorders and monitors will allow for repeats of certain training modules to successive classes and remote training in other plants without training staff participation.

Fit-Out - Miscellaneous Fit-Out Supplies

This category of Fit-Out/Rolling Stock is for the purchase of safety equipment, small tools, and first fills of equipment and supplies such as piping and other raw materials.

Lead Design Services

Purpose This phase consists of the contracts required to develop, manage, and support the design of the new treatment plant and residual facilities. The total estimated cost of Lead Design Services including the initial concept design is \$110.4 million.

**Expenditure
Forecast
and Schedule**

Contract	Total Contract Amount (\$000)	Begin date	End date
LDE Services	\$85,569	Aug 88	Dec 97
CADD I	\$5,475	Aug 88	Mar 93
CADD II	\$3,554	Jul 89	Jun 99
Geotech Services	\$9,707	May 89	Oct 89
Eng Servs During Const	\$6,060	Apr 93	Jun 99
TOTAL:	\$110,365		

Lead Design Engineer (LDE) Services

The LDE has primary responsibility for the overall design of the primary and secondary treatment facilities including the tunnels and on-site residuals management facilities. The LDE develops design criteria and standards, provides drawings and outline specifications at the 15-20% completion level for all facilities, and provides oversight management of all design work. The LDE also provides engineering services during construction (ESDC) focusing on the integrity of plant-wide systems, which contain components designed by a variety of firms. The LDE is managed from an overall program perspective by the CM, with emphasis on schedule, budget, constructability, and operability issues.

The LDE also performs ESDC services for certain facilities in order to maintain the integrity of the overall design. Under the ESDC program, the LDE will ensure complete and proper review and coordination of design changes that impact plant-wide systems. This is accomplished through review of selected contractor submittals to address compatibility with plant-wide systems and

maintenance. Various engineering models, plans, and documentation are also updated during construction to enable continued engineering coordination of facilities under construction.

The LDE contract also includes detailed design services for those facilities requiring early completion. These services were separate from LDE responsibilities and were performed by different staff. In this capacity, this separate staff functioned as a Project Design Engineer (PDE) and was managed by and reported to the LDE. During construction, this PDE provides traditional engineering services during construction and is managed by the CM.

Computer Aided Design and Drafting/Database (CADD I and II)

The MWRA has procured a single standardized Computer Aided Design and Drafting (CADD) system to ensure a cost-effective, functional, and integrated design and construction effort. This CADD system is used by most of the project design firms and the CM. The system consists of customized CADD software (using discipline-specific design applications and associated project libraries), computer processing units (CPUs), work stations/terminals, and related peripherals. In particular, CADD facilitates design and construction management in the following areas:

Site Control: Site management and coordination on Deer Island is critical because of the limited size and congested nature of the site as well as the need to continue operation of the existing plant during the construction period. The contract limits of the 40 plus construction contractors and the site infrastructure (roads, utilities, buildings, and topography) are continually updated, monitored, and controlled using the CADD system as a tool. The design contract drawings are all produced using the project coordinate grid for uniformity and interface control between contracts.

Uniform Drafting Standards: There are 32 design contracts performed by approximately 20 engineering and architectural firms. Uniform drafting standards among all designers are necessary to ensure consistent drawing development practices.

Standard Identification System: An estimated 30,000 - 40,000 discrete components are identified consistently in the drawings to enable contractors, the CM, and MWRA personnel to use a common method to identify and refer to these individual plant components.

Standard Component Data: A database management system is integrated with the CADD system to record and update equipment information for use during the design and construction phases. The system is adaptable for continued use of this information during operations of the plant.

Geotechnical Services

Geotechnical services provided geotechnical data along the Inter-Island Tunnel, the Outfall Tunnel, and diffuser alignments to assist in the siting and construction of the tunnels. These services consisted of drilling borings through the ocean floor into bedrock, retrieving soil and rock samples for recording and analysis to facilitate design of the tunnels, and providing geotechnical information for consideration by tunnel designers and contractors.

Engineering Services During Construction (ESDC)

Each Project Design Engineer (PDE) performs engineering services during construction for the elements of the project they designed. This consists of technical submittal review, Change Clarification Request/Non-Conformance Request (CCR/NCR) reviews, and progress reports and administration.

The PDEs review contractors' technical submittals such as shop drawings, installation procedures, material certifications, and testing procedures and results, to ensure that the contractors meet the technical requirements and the design intent of the contracts. The PDEs also track and monitor design changes made during construction to ensure that design documents clearly show these changes to the contractors.

1205. Water Transportation Facilities

Purpose

The construction of new primary and secondary treatment facilities at Deer Island and the conversion of the Nut Island Treatment Plant to a headworks facility are large, multi-year construction projects at sites which have limited land access. The MWRA has developed a transportation system to mitigate the impacts of transporting construction crews, materials, and vehicles, and to provide timely access and egress to the sites. The system transports all materials, equipment, and approximately 50 percent of construction personnel to and from the construction sites on Deer Island to avoid travel through the adjacent communities. The transport system includes ferry and barging services from the Fore River Staging Area in Quincy to Deer Island and barging services directly to and from Nut Island. It also includes bus service to Deer Island for approximately 50 percent of the construction work force.

The water transport system has required construction of staging facilities, piers, and terminals and the procurement of transport operating services at a total estimated cost of \$247.2 million.

For purposes of capital budgeting and project organization, Water Transportation Facilities is comprised of the eight phases listed in the table below, followed by a description of the scope for current construction and transport contracts.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Deer Island	\$34,395	Jun 88	Nov 91
Fore River Staging Area (FRSA)	\$66,019	Jan 88	Jun 99
Squantum Point	\$9,179	Jan 90	Dec 99
Revere Sugar	\$5,160	Aug 88	Oct 94
Nut Island	\$6,198	Jan 89	Feb 91
Design	\$7,747	Apr 87	Jun 93
WTS Operations	\$108,938	Nov 89	Dec 99
Other WTS	\$9,604	Jan 88	May 99
TOTAL:	\$247,240		

FRSA Utilities

Each construction contractor using the FRSA for staging consumes water, gas, and electricity. The MWRA pays directly for the utilities consumed during the course of construction, resulting in lower overhead costs. This contract also includes the costs of heating and providing power to the staging buildings constructed under CPs 012 and 017, as well as power required by the RO/RO operator.

Squantum Point Maintenance **Squantum Point Lease**

For construction workers commuting from the south and west of Boston, ferry service is provided from Squantum Point in Quincy. In previously completed contracts, the MWRA dredged the channel, and constructed a pier, a gangway, floats, and a secure parking area. The MWRA entered into an agreement with the MDC to design this facility in a manner consistent with the MDC's long-term development plan and to provide public access to Squantum Point at all times. Lighting and fencing has been installed. General maintenance and housekeeping on the floating pier, gangways, and access ramps is provided, including snow removal, de-icing, cleanup, and minor repairs.

Bus Transportation System (1989-1997) (CP-908) **Bus Transportation System (1998-1999) (CP-927)**

The land transport system for construction workers is based at Suffolk Downs in Revere. A private bus transportation operator maintains the buses to transport workers to and from Deer Island.

Water Transportation System - Personnel (1989-1997) (CP-918) **Water Transportation System - Personnel (1998-1999) (CP-926)**

The personnel transport system employs a private operator to provide and operate the vessels required for ferry service to Deer Island. The ferry service operates primarily from the Squantum Point and Rowes Wharf sites and covers all three construction shifts, with the majority of trips during the day.

The original contract was for five years, followed by two two-year renewal options, the first of which has been exercised, extending services through 1997. In addition to the vessels used to transport authorized personnel between the on-shore facilities and Deer Island, the operator supplies an on-call water taxi service for transport of personnel and delivery of small packages.

Water Transportation System - RO/RO Transport (1989-1997) (CP-907)
Water Transportation System - RO/RO Transport (1998-1999) (CP-925)

A private operator provides and operates vessels for transport of construction materials, equipment, and vehicles to and from Deer Island. The materials transport operator manages the Fore River Staging Area queue, the roll on/roll off piers, the transport vessels, and the Deer Island receiving area. The transport system operates five days per week for approximately 250 days per year. Materials transport began in June 1990.

The materials transport operator was awarded an initial five-year contract followed by two two-year renewal options. The operator is required to provide and operate a sufficient number of vessels to transport all scheduled vehicles between FRSA and Deer Island.

Rowes Wharf Permit

The MWRA has an agreement with the Rowes Wharf Operations Board that allows the Authority to operate a water shuttle to pick up and drop off passengers at the existing pier. Passengers are authorized personnel including construction workers, site engineers, MWRA staff, and regulatory agency staff.

1301. Residuals Management Facilities

Purpose Residuals, which are by-products of wastewater treatment processes, must be managed in an environmentally sound manner in order to comply with state and federal regulations. Improved management of residuals is critical to the Boston Harbor Project and is a key element in the federal court schedule.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Research/License Fee/Royalty	\$1,680	Aug 90	Jan 03
Design/RI/Construction Services	\$6,206	Aug 93	Jan 96
Construction	\$45,641	Aug 94	Jun 98
TOTAL:	\$53,527		

**Project
History and
Background**

The MWRA ceased the discharge of sludge and scum into Boston Harbor in December 1991. Interim and long-term treatment alternatives have been developed to manage these residuals of the wastewater treatment process.

An interim sludge processing and disposal phase included the construction and operation of sludge handling facilities at Deer Island, Nut Island, and the Fore River Staging Area (FRSA). The processing facility at the FRSA has four process trains and is equipped with air pollution and odor control equipment. The MWRA completed construction of these facilities and began operations in December 1991. As required by federal court order, the MWRA was responsible for ending the discharge of sludge into Boston Harbor.

The MWRA owns the sludge dewatering and drying facilities at the Fore River Staging Area (FRSA). A private contractor, the New England Fertilizer Company (NEFCO), has been engaged to haul sludge by barge to the FRSA, operate the facility, and market and or dispose of the final product.

This approach provides MWRA with ownership of the processing facilities and reserves the option of operating the facilities in the future. As part of the NEFCO agreement, the Authority made payments to NEFCO associated with the plant's control panel.

The MWRA is modifying and expanding the sludge processing facilities to accommodate the increased sludge volumes expected to be generated by the start-up of secondary treatment at Deer Island. In addition, the MWRA will construct two 14-inch sludge pipelines to convey sludge from the Deer Island Treatment Plant to the pelletizer facility at FRSA. One pipe is sized to convey peak sludge volume while the second pipe may act as a back-up sludge transport or for filtrate return. The sludge pipeline construction budget and schedule are included in the Braintree-Weymouth Relief Facilities project.

In October 1993, the MWRA sought and received approval for modification of the MWRA's Residual Management Facilities Plan. The modification substituted commercial disposal of wastewater residuals for immediate construction and operation of a backup landfill in Walpole. A commercial disposal contract provides transportation and disposal services for wastewater treatment residuals for 30 years. The Residuals Disposal Alternatives Evaluation Committee evaluated the costs of commercial disposal services versus the construction and operation of the Walpole landfill and concluded that the cost of commercial disposal services would be equal to or less than the cost of constructing and operating the Walpole landfill. In addition, the capacity of the commercial facilities is much larger than that of the Walpole site. This increased capacity provides greater flexibility in the Authority's operation of its residuals program.

Finally, the commercial disposal services allow the MWRA to fully comply with the requirements of the Clean Water Act. The cost of commercial disposal services are funded in the Current Expense Budget.

The MWRA has developed an "emergency preparedness plan" which addresses potential interruptions in backup sludge disposal arrangements, and retains ownership of the Walpole site, so that it can construct the landfill without delay if that is deemed necessary.

Scope

Phase	Scope
Des/CS/RI Pelletizing	Evaluate the capacity of the existing pelletizing plant and use the solids quantity projections derived from the Deer Island pilot plant and other design studies to make a decision on the scope of the expansion.

Fast Track Equipment Prepurchase	Prepurchase of two pellet coolers and screens.
Fast Track Equipment Installation	Installation of new safety and process equipment, two new screens, and a pelletizer air recirculation/scrubbing system.
Outside Construction	Work to be completed outside the pelletizing building including Pier 2 rehabilitation, additional rail tracks, an extension to the existing cake loadout garage, additional pellet silos, and increased pneumatic transport capacity.
Inside Equipment Prepurchase	Prepurchase of 12 centrifuges for dewatering sludge.
Inside Construction	Work to be completed inside the facility consists of dewatering equipment replacement, modifications to the four existing pelletizing trains, and installation of two new pelletizing trains. Some outside building and utility modifications are also included.
Residuals Research	Study the appropriate application methods, environmental impacts, and agronomic benefits of the MWRA's fertilizer in a variety of settings and investigate the cause of pellet self-heating and other microbial activity in the material. Study results will aid in developing recommendations for product use, answering questions about environmental suitability, and developing marketing strategies.
License Fee	License fees may be due to a patent holder, Enviro-gro, when NEFCO stops operating the facility.
Royalty Payment	Payment to the holder of the residual process patent.

Changes in Scope Since FY96-98 CIP

Phase	Change
Royalty Payment	New phase in the FY97-99 CIP.
Des/CS Pelletizing	Scope increase includes design of instrumentation and control updates, additional permitting and air emissions requirements, and design of pellet coating, chemical feed, and ventilation/RTO manifold systems.
Outside Construction	Elimination of four silos from the scope of work.

Inside Construction	Scope increase includes explosion suppression systems, cooling towers, air compressors, pellet coating, chemical feed, and ventilation/RTO manifold systems. Maintenance service agreement has been removed from CIP and will now be funded through CEB.
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CEB Impact

CEB line item	FY98	FY99	FY00	Description
Labor	\$530	(\$1,553)	(\$776)	No change in staff, assuming the MWRA renews the NEFCo contract on December 31, 1999.
Chemicals and Utilities	\$2,008,970	\$9,353	\$381,134	Due to projected increases in sludge volume associated with the commencement of D.I. Secondary B in October 1997, and Secondary C in October 1999. All dryers will be modified by FY99.
Maintenance	\$475,580	\$258,148	\$83,018	Required to support an increase in necessary equipment and additional usage associated with increase in sludge volume.
Other	\$1,563,707	\$232,049	\$460,436	Increase in contract costs for plant operator due to sludge volume.
TOTAL:	\$4,048,787	\$497,997	\$923,812	

1401. Combined Sewer Overflow Control Program

Purpose Portions of the MWRA sewerage system tributary area are served by combined sewers. During heavy rainstorms, sanitary and storm flows exceed the capacity of the collection pipes. The excess, untreated, combined sewerage is discharged to nearby receiving waters through relief conduits. These discharges, known as combined sewer overflows (CSO), contribute a variety of pollutants that impact local beaches and marine habitats.

The primary objective of the CSO Program is to develop and implement wastewater system improvements that control the volume, frequency, and pollutant loading of CSO discharges in compliance with the Clean Water Act and in accordance with federal and state laws and policies.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$28,321	Mar 88	Sep 99
Design/RI/Construction Services	\$57,904	Jan 96	Nov 08
Construction/SOP Program	\$291,444	Jan 94	Nov 08
Technical Review/Financial Audit	\$3,035	Jun 96	Jun 08
Technical Assistance/Land Easement	\$314	Mar 86	Feb 10
TOTAL:	\$381,018		

**Project
History and
Background**

Modern wastewater collection systems consist of separate pipelines to carry sewage and stormwater flows. In older regions of the country, including parts of metropolitan Boston, one pipeline system combines and transports these flows. Combined sewers are designed to carry dry weather flows (sanitary flows) and a portion of the storm flow.

During larger storms, when sanitary and storm flows exceed the capacity of the pipes, the combined sewer system is designed to allow the excess, untreated, combined sewage to discharge to relief conduits to nearby receiving waters, such as the harbor and tributary rivers. These discharges are called combined sewer overflows and the overflow points are typically referred to as CSOs.

In the MWRA service area, there are 81 permitted CSOs, located in Boston, Cambridge, Chelsea, and Somerville. During heavier rainstorms, these CSOs discharge to Chelsea Creek, Alewife Brook, Dorchester Bay, Boston Harbor, and the Charles, Mystic, and Neponset Rivers. CSOs in the Boston area are typically activated by rainfall that exceeds 0.1-inch depth, which means that approximately 60 rainfall events per year cause overflows.

CSO discharges contribute a variety of pollutants to local water bodies, primarily pathogenic microorganisms and floating debris. Affected beaches, which include L Street, Carson, Malibu, Tenean, Constitution, and Pleasure Bay beaches in Boston, are used by approximately 10,000 people per day during the summer months. CSO discharges also affect shellfish beds. Shellfish harvesting is prohibited or restricted in most of the shellfish beds in the Boston Harbor area due to contamination from CSOs and other pollution sources.

Scope

Phase	Scope
Consultant-Technical Assistance	Conduct preliminary planning services prior to and in support of the 1988-90 Facilities Planning/EIR efforts.
Planning/EIR	Conduct facilities planning and environmental review of CSO control alternatives. (1990 Recommended CSO Control Plan).
Master Planning	Improve the MWRA's understanding of the combined sewer and regional wastewater systems through system inspections, flow monitoring, water quality monitoring, and performance assessments; optimize the performance of the existing systems; reassess CSO control needs in the context of evolving EPA policy and a system master plan. (1994 CSO Conceptual Plan). Revise Facilities Plan/EIR accordingly.
Watershed Planning	Interact with and support external watershed planning efforts that may affect CSO control needs.
Modeling	Provide receiving water quality modeling support to the Master Planning efforts.
Design	Design for Construction phase.

System Optimization Plans (SOP) Implementation	The MWRA proposed SOP measures at 150 locations within the four CSO community systems with funding arranged through financial assistance agreements between MWRA and the CSO communities. Under the agreements, the communities will construct the improvements and be reimbursed by the MWRA for most associated costs. The SOPs include installing or modifying weir structures, blocking overflows, replacing tide gates, increasing the size of dry weather connections, and diverting separate stormwater around regulators.
CS/RI	Construction services and resident inspection for Construction phase.
Construction	Construction of CSO control facilities. Includes sewer separation, floatables controls, consolidation/storage conduits, interceptor relief, upgrading of existing CSO storage and treatment facilities, and new screening and disinfection facilities.
Technical Review/ Financial Review	Conduct as needed and bi-annual financial and technical review of construction projects being implemented by the CSO communities.
Technical Assistance	Conduct geotechnical survey services to support the 1990 Facilities Plan/EIR.
Land/Easement	As needed appraisal services.

Changes in Scope Since FY96-98

Phase	Change
Technical/ Financial Review	New phases in the FY97-99 CIP.
Land/Easement	New phase in the FY97-99 CIP.

Additional Project History and Background

In 1994, the Authority completed a Baseline Water Quality Assessment document which examined the existing water quality in 14 receiving water segments affected by CSOs. These segments were characterized and distinguished based on geographical location, frequency, and volume of existing CSO discharges, and existing uses (i.e. fishing, swimming, shell fishing, boating, etc.). All of these activities and resources are also affected to some degree by pollution from separate stormwater discharges and other point and non-point sources. While CSO control will improve water quality, other sources of pollution may still cause violations of water quality standards. The Baseline Water Quality Assessment report provides information on the loadings of various pollutants to these receiving waters from CSOs, separate stormwater, and upstream river sources.

MWRA Planning Efforts

In 1985, the U.S. Federal District Court, Massachusetts District, ruled that wastewater discharges into Boston Harbor were in violation of Federal Clean Water Act requirements and ordered MWRA to develop and implement an appropriate treatment plan. While CSO discharges were not part of the original suit, the MWRA agreed to take responsibility for CSOs in its service area in a stipulation entered into by the MWRA in Federal Court in 1987.

The first set of CSO milestones in the Court schedule included a requirement to conduct facilities planning and environmental review of CSO control alternatives. The Authority conducted this work in the period 1988-90 and completed a Facilities Plan and EIR in September 1990. The recommended control plan included construction of a deep tunnel storage system for most of the impacted receiving waters, with near surface storage proposed for Alewife Brook and limited sewer separation proposed in a few, small areas. The estimated capital cost of the plan, in 1990 dollars, was approximately \$1.2 billion.

In 1991, the Authority developed a new planning phase that was intended to build on the 1990 study and address several critical issues, including the need for more extensive flow monitoring, primarily to examine the impact of ongoing system upgrades (e.g. fast track pumping improvements at Deer Island) on CSO frequency and volume, and the need to evaluate CSO control in the context of a broader wastewater system master plan. To respond to these needs, the Authority initiated CSO/System Master Plan activities in 1992. The Master Plan involved the following planning objectives:

- *Improve the Authority's understanding of the combined sewer and regional wastewater systems through system inspections, flow monitoring, water quality monitoring, and performance assessments.*
- *Optimize the performance of the existing systems through relatively low cost, easily implemented structural and/or operational modifications.*
- *Reassess CSO control needs in the context of evolving EPA policy.*
- *Reassess CSO control needs in the context of a system master plan.*

Master Planning Recommendations

In December 1994, the Authority submitted copies of its Final CSO Conceptual Plan and System Master Plan to the parties in compliance with Schedule Six of the Boston Harbor Case. The report presented the Authority's preliminary recommendations for CSO control. It also examined how, since 1987, many of the Authority's completed and ongoing projects to improve the wastewater collection, transport, and treatment systems have markedly reduced CSO discharges.

These past and ongoing efforts, together with more recent system optimization recommendations and the new CSO facility recommendations, form the Authority's plan for long-term CSO control for Boston Harbor and its tributaries.

The recommended CSO control plan, at an estimated capital cost of \$350 million (includes Facilities Planning/EIR, Design, CS/RI, and Construction costs), resulted from extensive hydraulic, water quality, cost, and site analyses conducted on a wide range of CSO control alternatives tailored to each receiving water segment

The recommended CSO control plan focuses on the control of bacteria and floatables to increase swimming, shell fishing, and aesthetic/recreational uses of water bodies. Improvement of these uses through the control of bacteria and floatables is measured by reduction in the annual frequency of untreated combined sewer overflow events, as well as the reduction in the loading of these parameters. The recommended control levels are summarized as follows:

- Elimination (closure) of CSOs discharging to critical use (swimming and shell fishing) waters of Dorchester Bay, the Neponset River Estuary, and Constitution Beach.
- Reduction of untreated overflows (average of four or less per year remaining) in other water bodies.
- Construction of five new screening/disinfection facilities and upgrade of three of the existing CSO treatment facilities (Cottage Farm, Prison Point, and Somerville Marginal). The other three existing CSO facilities (Commercial Point, Fox Point, and Constitution Beach) will be decommissioned for CSO control following the completion of sewer separation projects recommended for those areas.

The table at the end of this project narrative provides a complete listing of the recommended CSO projects and associated capital costs. With the exception of the North Dorchester Bay and Reserved Channel areas, where a single screening and disinfection facility will store and treat flows from both sub-areas, separate receiving water controls are recommended for each sub-area.

The revised plan is substantially different from the Authority's 1990 tunnel plan. Lower CSO flows, improved performance of the Authority's transport and treatment systems, and the Authority's receiving-water approach to CSO planning were the key factors in the development of a more cost-effective CSO control program. In 1996, federal EPA officially approved the revised plan for implementation.

The recommended CSO control plan was developed as a component of an overall System Master Plan, which also addressed I/I reduction, interceptor relief, and secondary treatment. As a result of this work, the report presents several conclusions:

- The MWRA conclude that an overall moderate level of I/I control, at an estimated cost of \$137 million, can be achieved from a variety of factors, including community infrastructure improvement and maintenance programs, the MWRA Financial Assistance Program, and its new flow-based wholesale sewer rate methodology. The overall result will be to improve the condition of the community and MWRA infrastructure and to preclude any additional increase in I/I flows within the system. The I/I conclusions and recommendations will be further addressed under the Authority's I/I Financial Assistance Program and other MWRA community I/I programs.
- The Authority identified hydraulic problems in its interceptor system and included recommendations to resolve these deficiencies. The Sewerage Division will incorporate these recommendations, estimated to cost up to \$30 million, into its Comprehensive Long-Range Plan. This CIP includes a new project, System Master Plan (SMP) Interceptors, based on these recommendations. Other proposed interceptor improvements, which primarily target structural problems, will also be incorporated into the comprehensive plan. The plan will establish priorities for implementation of the interceptor projects.
- Based upon the preliminary evaluations of secondary treatment capacity completed under the System Master Plan, the Authority determined that between two and two-thirds and three batteries (720 to 810 million gallons) of secondary treatment capacity were required at Deer Island, as opposed to the four batteries proposed in the 1988 Secondary Treatment Facilities Plan. These preliminary results were evaluated in more detail in a report issued under the Authority's DP-29 contract (Deer Island Concept Design Reassessment). In 1995, the federal court eliminated the need to build a fourth secondary treatment battery from the BHP.

A brief description of the water quality concerns, CSO control goals and recommended projects follows:

North Dorchester Bay

North Dorchester Bay is classified SB-Fishable/Swimmable with restricted shell fishing in approved areas. Swimming beaches and shell fishing areas are considered to be critical/sensitive use areas in federal and state CSO policies. The CSO control goal is full attainment of beneficial use by eliminating all CSOs. CSO relocation is preferred over sewer separation, although cost is similar, because sewer separation would introduce additional stormwater and its associated pollutant load to the receiving water.

Recommended Projects:

- Relocate CSOs to Reserved Channel to eliminate CSO outfalls BOS081-BOS087
- Build CSO screening and disinfection facility on Reserved Channel

South Dorchester Bay

South Dorchester Bay is classified SB-Fishable/Swimmable with restricted shell fishing. The CSO control goal is full attainment of beneficial use by eliminating all CSOs. Relocation of CSOs from this receiving water is not feasible.

Recommended Projects:

Short Term

- Upgrade Fox Point Facility to dechlorination
- Upgrade Commercial Point Facility to dechlorination

Long Term

- Separate sewers to eliminate CSO outfalls BOS088-BOS090

Neponset River

The Neponset River is classified SB-Fishable/Swimmable with restricted shell fishing. The CSO control goal is full attainment of beneficial use by eliminating all CSOs. Relocation of CSOs from this receiving water is not feasible.

Recommended Projects:

- Separate sewers to eliminate CSO outfalls BOS093-BOS095

Constitution Beach

Constitution Beach is classified SB-Fishable/Swimmable with restricted shell fishing. The CSO control goal is full attainment of beneficial use by eliminating all CSOs. Relocation of CSOs from this receiving water is not feasible.

Recommended Projects:

- Separate sewers to eliminate CSO outfall BOS002

Upper Charles River

The Upper Charles River is classified B-Fishable/Swimmable and other compatible uses. This section of the Charles River is subject to high recreational uses and heavy stormwater impacts. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average and by treating more frequent overflows.

Recommended Projects:

- Build screening and disinfection facility at outfall CAM005
- Relieve interceptor connection at outfall BOS032
- Install floatables controls at remaining outfalls

Lower Charles River

The Lower Charles River is classified B-Fishable/Swimmable and other compatible uses and is subject to high recreational uses and heavy stormwater impacts. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average, by treating more frequent overflows and by improving existing treatment.

Recommended Projects:

- Build screening and disinfection facility for Stony Brook flows (outfall MWR023)
- Upgrade Cottage Farm Facility to dechlorination
- Upgrade Cottage Farm outfall (MWR201)
- Install floatables controls at remaining outfalls
- Eliminate CSO outfalls MWR010 and BOS042

Back Bay Fens

The Back Bay Fens is classified B-Fishable/Swimmable and other compatible uses. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average and treat these remaining flows.

Recommended Projects:

- Reduce CSO discharges at outfall BOS046 (the proposed screening and disinfection facility on Stony Brook is intended to treat BOS046 overflows as well as Stony Brook discharges to the Charles River.)

Alewife Brook

Alewife Brook is classified B-Fishable/Swimmable. The brook is subject to large stormwater impacts. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average. Recommended Projects:

- Separate sewers upstream of CAM002 and CAM004
- Separate baffle manholes upstream of outfall SOM001
- Install floatables controls at the eight remaining outfalls

Upper Mystic River

The Upper Mystic River is classified B-Fishable/Swimmable. The Upper Mystic River is subject to large stormwater impacts. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average.

Recommended Projects:

- Separate baffle manholes upstream of outfalls SOM006 and SOM007

Mystic/Chelsea Confluence

The Mystic/Chelsea Confluence is classified SB-Fishable/Swimmable with restricted shell fishing. This water body is subject to industrial water uses and Mystic River discharge impacts. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average, by treating more frequent overflows and by improving existing treatment.

Recommended Projects:

- Upgrade Somerville Marginal to dechlorination
- Relieve Chelsea Branch Sewer to reduce CSO overflows at outfall CHE008
- Build screening and disinfection facility at BOS017
- Relieve City trunk sewer at outfalls CHE002-CHE004
- Inspect/repair outfall CHE008
- Install floatables controls at remaining outfalls

Upper Inner Harbor

The Upper Inner Harbor is classified SB-Fishable/Swimmable with restricted shell fishing. This water body is subject to large impacts from stormwater and Charles River flows. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average, by treating more frequent overflows and by improving existing treatment.

Recommended Projects:

- Upgrade Prison Point to dechlorination
- Build screening and disinfection facility at BOS019
- Relieve East Boston Branch Sewer to reduce CSO overflows at outfalls BOS009-BOS013
- Install floatables controls at remaining outfalls

Lower Inner Harbor

The Lower Inner Harbor is classified SB-Fishable/Swimmable with restricted shell fishing. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average.

Recommended Projects:

- Relieve East Boston Branch sewer to reduce overflows at outfalls BOS003-BOS007
- Install floatables controls at remaining outfalls

Fort Point Channel

The Fort Point Channel is classified SB-Fishable/Swimmable with restricted shell fishing. This water body is subject to high commercial/industrial use, high stormwater impacts and high CSO impacts. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average and treating more frequent overflows.

Recommended Projects:

- Build detention/treatment facility for Union Park Pump Station flows
- Build in-line storage capability into the Dorchester Brook Conduit
- Build a storage/consolidation conduit to reduce overflows at outfalls BOS072-BOS073
- Install floatables controls at remaining outfalls

Reserved Channel

The Reserved Channel is classified SB-Fishable/Swimmable with restricted shell fishing. This water body is subject to high commercial/industrial use. Under the CSO Plan, it will receive relocated CSOs from North Dorchester Bay. The CSO control goal is to attain beneficial uses for most of the year by reducing untreated CSOs to 4 or less events per year on average and treating these remaining overflows.

Recommended Projects:

- Build a storage/consolidation conduit to the proposed screening and disinfection facility (see North Dorchester Bay, above) to reduce and treat overflows BOS076-BOS080

- Install floatables controls at remaining outfalls

CSO Implementation Plan and Schedule

Implementation Plan

The CSO Conceptual Plan proposes that some of the recommended CSO projects will be implemented by the Authority and others will be implemented by the CSO communities. The Authority's responsibilities will include facilities planning and MEPA review of all projects, as well as design and construction of those projects that will result in MWRA-owned facilities. The communities implementation responsibilities will include permitting, design, and construction of those projects that will result in community-owned facilities.

Under the plan, roughly \$130 million of the total \$350 million in projects will be implemented by the local communities. The CSO Conceptual Plan assumed that all capital costs for the planning, design and construction of the CSO projects, including the projects that will be implemented by the communities, would be funded under the Authority's CIP. Memoranda of Understanding (MOUs) and financial assistance agreements with the CSO communities will be required.

The implementation responsibilities discussed above reflect directly the longer term ownership, operation and maintenance requirements of the facilities, with the exception of projects in Chelsea, which will be implemented, but not owned, by the MWRA.

Community-owned and operated facilities will include:

- Improvements to existing local systems, including new sewers and storm drains that will be constructed to separate combined sewers.
- Manual bar screens or other floatables controls that will serve community-owned CSO outfalls.

MWRA-owned and operated facilities will include:

- New sewers and storage conduits that will upgrade the capacities of existing MWRA-owned sewers (Chelsea Branch Sewer and East Boston Branch Sewer) or that will constitute major extensions to existing MWRA and local sewer systems.
- Any upgraded or new CSO treatment facility.
- Manual bar screens or other floatables controls that will serve MWRA-owned CSO outfalls.

Schedule

The Final CSO Conceptual Plan/SMP Report included a "Proposed Implementation Schedule", which presented time frames for facilities planning, design, and construction of the CSO projects recommended in the report. Overall, the proposed schedule suggested an aggressive, 15-year implementation period (through 2010). Adjustments to the schedule have been made through discussions with the communities, EPA and other parties relative to the development of MOUs and agreement on court schedule milestones. All projects will be implemented in compliance with court schedule milestones, which were established in May 1996. Changes to the schedule also may result from the MEPA and Partial Use Designation reviews over the next two to three years, as well as from the ongoing state watershed planning efforts.

An ENF for the new CSO Control Plan was submitted to MEPA in April, 1995. The ENF covered all of the CSO projects, requested "Major and Complicated Project" designation, and proposed an approach and schedule for grouping the projects and performing appropriate levels of review. MEPA decisions on the ENF were issued in July, 1995. The decisions included a waiver allowing several projects to proceed into design and construction prior to completion of an EIR. These projects include sewer separation, in-system storage, upgrade of existing CSO facilities and baffle manhole separation. The decisions also include the designation of the CSO plan as "Major and Complicated", a requirement for submission of an interim siting assessment, as well as draft and final EIRs, and the establishment of a Technical Advisory Committee (TAC) to oversee planning and support the secretary's review. The Draft and the Final Facilities Plan/EIR are scheduled to be submitted to MEPA in October 1996 and April 1997, respectively.

Facilities planning and environmental review services (Master Planning, Phase II) commenced in April, 1995. Most of the projects, those not included in the Secretary's waiver, will not move into the design and construction phases until after completion and acceptance of the Final Facilities Plan/EIR in June 1997.

Revision of Water Quality Standards

The MWRA's CSO Plan is subject to review and approval for compliance with the state Water Quality Standards (WQS). Several of the MWRA and community projects are tentatively scheduled to proceed to design and/or construction in 1996 and 1997, assuming that little or no MEPA review beyond the ENF will be required of these projects. While it is expected that most or all of the controls will be accepted as complying with the state's BCSO designation, approval of certain parts of the plan, most notable Charles River controls, may require the issuance of a waiver or the revision of water quality standards to provide a Partial user Designation. Under the new court schedule for CSO control, DEP must issue its

determinations by September, 1997, based on review of the Facilities Plan and EIR.

Coordination with Other Major Projects

Several of the CSO projects may be affected by major projects proposed by others (e.g. I-93 Reconstruction in Somerville, Central Artery). Coordination efforts are essential.

Watershed Planning

The Authority plays an active role in support of watershed planning activities, working closely with EOEA's Watershed Initiative Steering Committee, Technical Advisory Group subcommittee and Process Group subcommittee and with the technical committee overseeing the ongoing Charles River Watershed Association's (CRWA) watershed planning efforts. The Authority is also partially funding the Charles River Watershed Association's study, as approved on October 5, 1994 and May 1, 1996. The results of the state and CRWA planning efforts may affect the level of CSO control that is determined to be necessary and cost-effective in meeting water quality standards. The CSO Plan was developed in the context of overall pollution impacts from CSO and non-CSO sources. Watershed planning is necessary to develop a comprehensive plan for water quality improvement in the various receiving waters.

FY97 Impacts

Master Planning: Phase II services will continue, including submission of the Draft Facilities Plan/EIR in October and submission of the Final Facilities Plan/EIR in April 1996.

SOP Implementation: Implementation of the recommended SOP projects by the CSO communities will be completed by December 1996. Somerville will complete the baffle manhole separation projects in the same timeframe.

Design: Design services that began in FY96 will continue through FY97. These include upgrade of existing CSO facilities and floatables controls by MWRA, and sewer separation in Dorchester and Neponset by BWSC. New design starts in FY97 will include Alewife Brook sewer separation by Cambridge, Constitution Beach sewer separation by BWSC, and floatables controls by BWSC and Cambridge.

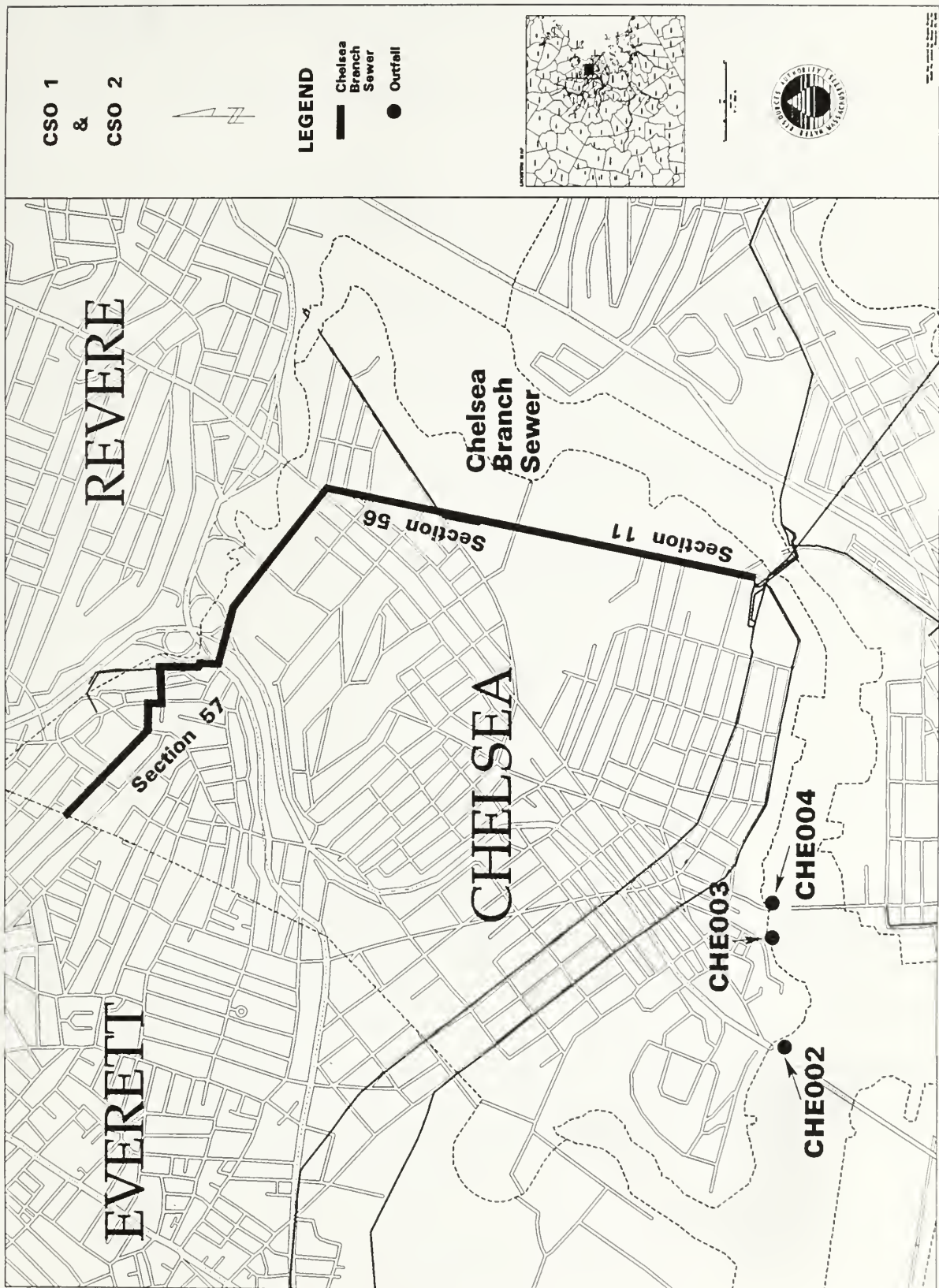
Watershed Planning: The Authority will continue to support EOEA and Charles River Watershed Association efforts in FY97.

Construction: Construction of Neponset sewer separation by BWSC began in FY96 and will continue through FY97. No new construction start is scheduled in FY97.

CEB Impact A cost breakdown by component is not available because facilities planning is not yet complete. CEB impacts are not broken out by cost category because these costs are based on a lump sum projection from the FY97 CEB.

	FY98	FY99	FY00	FY01-07
Total	\$2,400	\$19,800	\$3,900	\$2,558,253

Please note: The CEB impact of the projects implemented and owned by BWSC, Cambridge, Somerville, and Chelsea are not included in the above operating cost projection.



CSO CONTROL PLAN AND IMPLEMENTATION SCHEDULES

Community	Receiving Water	Project	Capital Cost	Facility			Project Implementation			Design		Construction		Start Date	Construction	
				Ownership	Design	Construction	Planning	Design	Construction	Start Date	Start Date	Start Date	End Date	Start Date	End Date	End Date
BWSC	Upper Charles	Interceptor Connection Relief BOS032	\$1,013,000	BWSC	BWSC	BWSC	BWSC	BWSC	BWSC	Jan-98	Jan-98	Jul-99	Jun-00	Jan-98	Jul-99	Jun-00
	Fort Point Channel	In-Line Storage Dorchester Brook Conduit	\$3,801,000	BWSC	BWSC	BWSC	BWSC	BWSC	BWSC	Jul-00	Jul-00	Apr-03	Sep-04	Jul-00	Apr-03	Sep-04
	South Dorchester Bay	Sewer Separation at BOS088-BOS090	\$87,437,000	BWSC	BWSC	BWSC	BWSC	BWSC	BWSC	Jun-96	Jun-96	Nov-98	Nov-08	Jun-96	Nov-98	Nov-08
	Constitution Beach	Sewer Separation at BOS002	\$8,236,000	BWSC	BWSC	BWSC	BWSC	BWSC	BWSC	Jan-97	Jan-97	Apr-99	Oct-00	Jan-97	Apr-99	Oct-00
	Neponset River	Sewer Separation at BOS093-BOS095	\$10,128,000	BWSC	BWSC	BWSC	BWSC	BWSC	BWSC	Jan-95	Jan-95	Apr-96	Jun-00	Jan-95	Apr-96	Jun-00
CAMBRIDGE	Alwile	Sewer Separation at CAM002 & CAM004	\$11,174,000	CAM	CAM	CAM	CAM	CAM	CAM	Jan-97	Jan-97	Jul-98	Jan-00	Jan-97	Jul-98	Jan-00
CHELSEA	Mystic/Chelsea Confl.	Outfall Repairs & Floatable Control CHE008	\$1,322,000	CHE	MWRA	MWRA	MWRA	MWRA	MWRA	Dec-98	Dec-98	Jul-00	Jan-01	Dec-98	Jul-00	Jan-01
	Mystic/Chelsea	Trunk Sewer Relief CHE002 to CHE004	\$1,877,000	CHE	MWRA	MWRA	MWRA	MWRA	MWRA	Jul-97	Jul-97	Sep-99	Aug-00	Jul-97	Sep-99	Aug-00
	Reserved Channel	Consolidation to Screen and Disinfection Facility BOS076-080	\$32,534,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Dec-99	Dec-99	Mar-03	Mar-05	Dec-99	Mar-03	Mar-05
	North Dorchester Bay	CSO Relocation to Reserved Channel	\$40,597,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jul-97	Jul-97	Sep-00	Mar-03	Jul-97	Sep-00	Mar-03
	North Dorchester Bay	Reserved Channel CSO Treatment Facility	\$40,597,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Dec-99	Dec-99	Mar-03	Mar-05	Dec-99	Mar-03	Mar-05
MWRA	Fort Point Channel	Detention/Treatment of Union Park Pump Station Flows	\$15,653,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Mar-00	Mar-00	Mar-03	Sep-05	Mar-00	Mar-03	Sep-05
	Up & Low Inner Harbor	Interceptor Relief BOS003-014	\$35,597,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jan-03	Jan-03	Mar-05	Sep-06	Jan-03	Mar-05	Sep-06
	Mystic/Chelsea Confl.	Screen & Disinfect. BOS017	\$2,122,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jan-03	Jan-03	Mar-05	Sep-06	Jan-03	Mar-05	Sep-06
	Upper Inner Harbor	Screen & Disinfect BOS019	\$2,122,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jul-97	Jul-97	Oct-99	Mar-01	Jul-97	Oct-99	Mar-01
	Upper Charles	Screen & Disinfect CAM005	\$2,775,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jul-97	Jul-97	Mar-00	Mar-02	Jul-97	Mar-00	Mar-02
	Lower Charles	Screen & Disinfect. Stony Brook Conduit Flows	\$23,310,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jul-02	Jul-02	Mar-05	Mar-07	Jul-02	Mar-05	Mar-07
	Fort Point Channel	Storage/Consolidation Conduit BOS072-073	\$4,857,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Mar-98	Mar-99	Jun-96	Mar-98	Mar-99
	Lower Charles	Upgrade Cottage Farm Facility to Dechlorination	\$2,921,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Mar-98	Mar-99	Jun-96	Mar-98	Mar-99
	Lower Charles	Upgrade Cottage Farm Outfall	\$3,000,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Mar-98	Mar-99	Jun-96	Mar-98	Mar-99
	South Dorchester Bay	Upgrade Fox Point Facility to Dechlorination	\$2,210,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Oct-97	Jun-98	Jun-96	Oct-97	Jun-98
	South Dorchester Bay	Upgrade Commercial Point Facility to Dechlorination	\$854,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Oct-97	Jun-98	Jun-96	Oct-97	Jun-98
	Upper Inner Harbor	Upgrade Prison Point Facility to Dechlorination	\$3,252,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Oct-97	Jun-98	Jun-96	Oct-97	Jun-98
	Mystic/Chelsea Confl.	Upgrade Somerville Marginal Facility to Dechlorination	\$1,381,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jun-96	Jun-96	Mar-98	Sep-99	Jun-96	Mar-98	Sep-99
	Mystic/Chelsea	Chelsea Branch Interceptor Relief	\$4,172,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Jul-97	Jul-97	Dec-99	Jun-01	Jul-97	Dec-99	Jun-01
Region Wide		Independent Floatables Controls & Outfall Closing Projects	\$1,811,000	BWSC	BWSC	BWSC	BWSC	BWSC	BWSC	Dec-96	Dec-96	May-99	May-01	Dec-96	May-99	May-01
			\$970,000	CAM	CAM	CAM	CAM	CAM	CAM	Nov-98	Nov-98	May-99	May-01	Nov-98	May-99	May-01
			\$369,000	CHE	CHE	CHE	CHE	CHE	CHE							
			\$0	CHE	CHE	CHE	CHE	CHE	CHE							
			\$138,000	SOM	SOM	SOM	SOM	SOM	SOM	Nov-98	Nov-98	May-99	May-01	Nov-98	May-99	May-01
			\$334,000	MWRA	MWRA	MWRA	MWRA	MWRA	MWRA	Aug-96	Aug-96	Oct-98	Sep-00	Aug-96	Oct-98	Sep-00
		Total	\$344,753,000													

1501. Infiltration/Inflow Local Financial Assistance Program

Purpose Infiltration/inflow (I/I), groundwater and stormwater which enters the collection system, contributes more than half of the total wastewater flow that the Authority treats. This depletes capacity that would otherwise be available to transmit sanitary flows. This situation results in sewer surcharging, overflows of untreated sewage, more frequent combined sewage overflows, and higher pumping and treatment costs. The I/I Program provides funding incentives for communities to rehabilitate their collection systems with the goal of structurally reducing I/I flows.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Grant	\$15,937	May 93	Jun 05
Loan	\$47,664	May 93	Jun 05
Repayment	(\$47,664)	May 94	Jun 06
TOTAL:	\$15,937		

**Project
History and
Background**

The MWRA's wastewater treatment plants receive flow from 43 communities. The collection system encompasses 230 miles of MWRA interceptors and 5,400 miles of community sewers. These sewers are of varying size, shape, age, material, depth, and condition, but all contribute some quantity of infiltration and inflow (I/I).

On August 19, 1992, the MWRA Board of Directors approved \$25 million to fund the I/I Local Financial Assistance Program. The program provides funding incentives for communities to rehabilitate their collection systems with the goal of structurally reducing I/I flows. The Authority allocated \$25 million to the 43 sewer service area communities based on their share of the fiscal year 1993 sewer assessment. Each award consists of a 25% grant and a 75% interest free loan. Binding commitments for funds are issued by the Authority in the form of Financial Assistance Agreements. This initial program was conducted over two years.

The I/I Local Financial Assistance Program helps meet the Massachusetts Department of Environmental Protection (DEP) grant condition for the Wellesley Extension Sewer Replacement project that requires the MWRA to reduce inflow in the southern collection system by 53 million gallons per day. The grant condition requires the Authority to return the DEP grant funds (\$41.4 million) if it does not achieve inflow removal. Through November 1995, communities in the southern system had completed rehabilitation projects which resulted in 74 million gallons per day of inflow removal. The inflow removal was documented in a letter to DEP, dated December 11, 1995. The Authority will continue to aggressively pursue I/I reduction through cooperative efforts with all 43 MWRA sewer communities.

Through May, 1996, the MWRA has distributed a total of \$30.3 million in funds to 38 of the 43 communities under the I/I Local Financial Assistance Program.

On June 28, 1995, the MWRA approved \$38.75 million to fund the second phase of the I/I Local Financial Assistance Program, which will be conducted over a ten year period. In addition, the \$2 million which remained unused from the initial program was rolled over into the Phase II program. These funds will again be distributed to fund local I/I reduction projects as 25 percent grants and 75 percent interest-free loans.

Scope

Phase	Scope
Grant & Loan	Amount allocated to a community in proportion to community's share of rate revenue. Grant portion is 25% and loan portion is 75% of total award.
Repayment	Loans are repayable to the Authority in five equal annual payments beginning one year after the funds are distributed.

Changes in Scope since FY96-98 CIP

None.

CEB Impact

The CEB impact may be reductions in the marginal costs of transporting and treating flow at the Deer Island plant. The Authority will evaluate these costs after Phase I start-up at Deer Island.

WATERWORKS



WATERWORKS IMPROVEMENT PROGRAM
AND
CAPITAL EXPENDITURE BUDGET
FY 1997 - FY 1999

Introduction

The MWRA's Waterworks Division is responsible for operating and maintaining the water delivery system. The Waterworks system service area includes 47 communities with a total service population of approximately two million people.

The division operates and maintains 129 miles of aqueducts and tunnels, four hydroelectric power stations, 11 chemical feed stations, 265 miles of distribution pipelines, 12 distribution pump stations, 16 distribution reservoirs, and numerous buildings, dams, roads, and other facilities.

The Waterworks Division is responsible for identification of the system's capital needs including planning, design, and construction of all capital improvements.

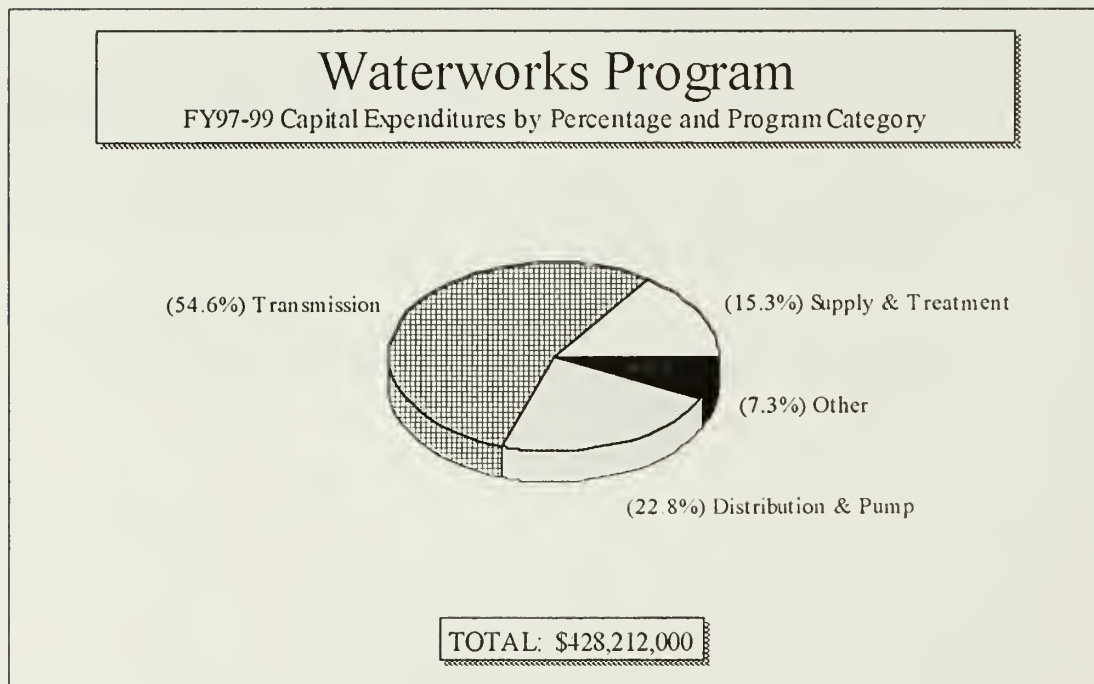
Capital Budget Summary

The Waterworks improvement program budget for the three year period FY97-99 is \$428 million. The program is comprised of four program categories: water supply and treatment, transmission, distribution and pumping, and other capital projects. The table on the following page presents projected expenditures in each category. Retainage payments due for completed projects are also included in the totals.

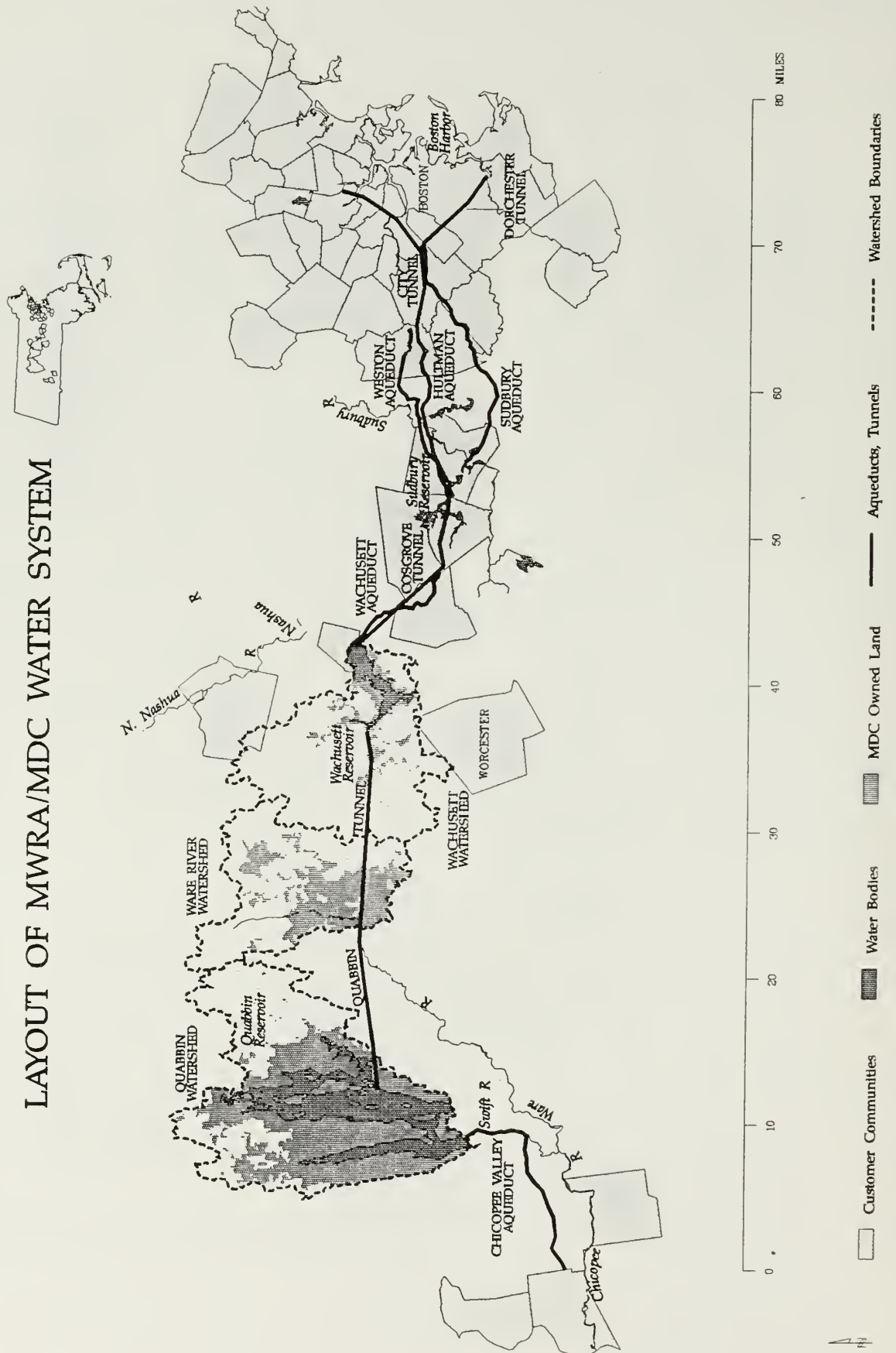
An additional \$1.13 billion in expenditures beyond FY99 will be needed for project phases scheduled for completion after June 30, 1999.

Waterworks Program by Program Category (\$000)

Program Category	FY97	FY98	FY99	FY97-99 Total	Beyond 1999
Supply & Treatment	\$15,488	\$25,893	\$23,948	\$65,329	\$447,288
Transmission	60,439	82,790	90,525	233,754	385,927
Distribution & Pumping	21,615	45,560	30,575	97,750	319,238
Other Projects	<u>4,289</u>	<u>11,307</u>	<u>15,783</u>	<u>31,379</u>	<u>(19,649)</u>
Total	\$101,831	\$165,550	\$160,831	\$428,212	\$1,132,804



LAYOUT OF MWRA/MDC WATER SYSTEM



2101. Drinking Water Quality Improvements (Wachusett)

Purpose To improve the quality of MWRA drinking water by constructing treatment and storage facilities to improve drinking water quality and meet federal and state standards and regulations. Major components include the Walnut Hill treatment plant for Wachusett Reservoir water, an interim corrosion control facility, and covered storage at Norumbega Reservoir.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
SDWA Studies	\$3,052	Jan 88	Oct 98
Wachusett Water Treatment Plant:			
EIR/Conceptual Design	\$5,775	Nov 93	Apr 96
Design/CA/RI	\$43,543	Sep 96	Dec 03
Design Management Support	\$2,824	Jan 97	Oct 98
Construction	\$335,408	Nov 99	Dec 03
Construction Management Support	\$3,963	Mar 99	Dec 03
DEP Fees	\$36	Jul 93	Jun 98
Norumbega Covered Storage:			
Preliminary Design	\$1,728	Sep 92	Jul 97
Design/CA/RI	\$6,307	Dec 97	Aug 04
Construction	\$95,054	Jul 00	Aug 04
Appraisal	\$17	Nov 95	Jun 00
Land	\$160	Dec 96	Jan 97
Interim Corrosion Control:			
Design/CA/RI	\$1,835	Jul 93	May 97

Construction	\$6,443	Dec 94	Jun 97
Equipment Purchase	\$75	Apr 96	Jun 96
Technical Assistance	\$18	Jan 88	Dec 03
TOTAL:	\$506,238		

Project History and Background

The MWRA is committed to providing the highest quality drinking water to its customers and to ensure that the water it delivers meets the drinking water quality standards established by the federal Safe Drinking Water Act (SDWA). Meeting this commitment will require significant changes to the procedures and facilities used by the MWRA to provide quality water.

On September 13, 1995, the MWRA Board of Directors conducted a special meeting dedicated to Waterworks system improvements. The focus of the meeting was an integrated plan to improve the supply, transmission, and storage facilities which deliver drinking water to MWRA customers. The overall plan is comprised of three major components and corresponding inter-dependent capital projects:

- Supply: Walnut Hill Water Treatment Plant and the Interim Corrosion Control facility
- Transmission: MetroWest Tunnel
- Storage: Norumbega and Other Covered Storage Distribution Facilities

The Drinking Water Quality Improvements (Wachusett) project, formerly titled "Safe Drinking Water Act Compliance Program", includes the treatment facilities and two covered storage facilities which are cornerstones of the Waterworks integrated system plan.

Applicable State and Federal Requirements

The Surface Water Treatment Rule (SWTR), promulgated by the U.S. Environmental Protection Agency (EPA) in 1989, specifies the conditions under which filtration of surface water supplies is required and mandates the use of more potent disinfection techniques. Since 1977, existing state regulations have dictated that once water has received final treatment all downstream storage must be in enclosed facilities to preserve quality. The Lead and Copper Rule, promulgated in 1991, requires treatment actions to reduce the water's corrosivity if excessive levels of lead or copper are detected at consumers' taps. The EPA issued the Disinfectants and Disinfectants By-Products Rule (D/DBP Rule) and the Enhanced Surface Water Treatment Rule (ESWTR) in draft form in June 1994. The D/DBP (Stage I) Rule is scheduled to be promulgated in December 1996. The D/DBP Rule will limit the concentration of certain chemicals of concern which form when water is disinfected.

The U.S. EPA, in the proposed ESWTR, is considering revisions to the Surface Water Treatment Rule which would require that surface water systems with proven quality source waters remove microbiological contaminants above levels currently required by the SWTR. In addition, the EPA is considering requiring surface water systems to treat for *cryptosporidium*. ESWTR is scheduled to be promulgated several years later than D/DBP Rule.

The Information Collection Rule (ICR), became effective early in 1996, requires surface water systems to collect additional data on occurrence, treatment, and characterization of disinfectants, disinfection by-products, and microorganisms. Ultimately, the EPA will use the data assembled from sources across the country to set enforceable limits for various disinfectant and disinfectant by-products and microorganisms in the D/DBP Rule (Stage II) and ESWTR. In anticipation of the Information Collection Rule, MWRA began collecting various water quality data in February 1994.

From prior MWRA studies it is known that the watersheds around the sources must be better protected, disinfection and corrosion control facilities must be modified and upgraded, and the use of open distribution reservoirs must be phased out. Construction of a filtration plant for Wachusett Reservoirs water will be required unless source water quality can be sufficiently improved.

The Massachusetts Department of Environmental Protection (DEP) is responsible for administering and enforcing water quality standards in the Commonwealth.

The MWRA intends to continue working with the Massachusetts DEP and the U.S. EPA to develop a drinking water quality improvement program which satisfies the law, yet provides a cost effective and reliable approach to meeting this need.

Consent Order Terms

In 1990, DEP promulgated the state's version of the Surface Water Treatment Rule and issued guidelines on the application process for a filtration waiver. While the MWRA initially intended to seek waivers for both the Quabbin and Wachusett Reservoirs, the effort to obtain a waiver for the Wachusett Reservoir was suspended in January 1991 after several months of testing indicated that total and fecal coliform levels in the reservoir exceeded the limit for avoiding filtration. (Quabbin Reservoir did qualify for a waiver, as is described in Project #2102, Drinking Water Quality Improvements (Quabbin)). Subsequently, in January 1992, the DEP issued a determination that filtration would be required for Wachusett Reservoir.

During negotiation of the DEP Consent Order to enforce the SWTR, the MWRA was successful in securing terms which would provide additional flexibility relative to the Wachusett Reservoir filtration requirement. On June 11, 1993, the MWRA, MDC, and DEP signed a Consent Order which outlines the obligations for compliance with the SWTR under a dual track approach.

The filtration track requires the MWRA to continue preparations for constructing a filtration facility by December 2001. Preliminary and final designs for filtration and disinfection facilities must be completed by 1998. The non-filtration track allows the MWRA and the MDC to take actions which may enable the Wachusett Reservoir to meet the criteria for a filtration waiver prior to the start of construction of a water treatment facility, reducing its cost significantly.

The non-filtration track stipulated that a Watershed Protection Plan be formally submitted to DEP by September 1, 1993 and that it be implemented by July 31, 1998. Furthermore, source water quality improvement must be achieved, as demonstrated by meeting the coliform standard for a consecutive 12-month period.

The Consent Order also established schedules for coming into compliance with requirements for covered storage: Construction of covered storage to be completed by December 31, 1998, at Fells Reservoir, and Norumbega Reservoir to be in compliance by December 31, 2000. The use of Spot Pond and Weston Reservoir must be discontinued by November 30, 1997, and July 31, 2001, respectively. *It should be noted that the project schedules for the water treatment plant and the Norumbega covered storage facility included in this CIP differ from the current Consent Order schedules. These revised schedules will require DEP approval.*

Watershed Protection Needs

Under the Reservoir Risk Assessment project which was completed in 1992, the MWRA and the MDC jointly produced watershed protection plans for each of the sources. Consistent with DEP guidelines, the plans described the physical characteristics of the watersheds, evaluated existing and potential pollution threats, and recommended measures to control those threats.

In the Wachusett Reservoir watershed, the most serious threats were judged to be failing and substandard septic systems, poor quality storm water runoff, and gull populations near the intake. Other factors of concern included the high development density near the reservoir, the low percentage of land ownership by the MDC, and the risk of a transportation accident which could cause chemical contamination of the reservoir. To address these problems the MDC will need to carry out an aggressive protection program over the next four years including such measures as acquisition of additional land parcels near tributaries, implementation and enforcement of the Cohen bill land used restrictions, development of plans for sewers to replace septic systems in some areas, provision of technical assistance to local communities and boards of health, and stepped-up efforts to prevent gulls from congregating near the intake. As part of this project's environmental review phase, a re-evaluation of the watershed protection plan was conducted to determine if some changes or accelerated measures could help improve the likelihood of meeting the filtration avoidance criteria.

The cooperation and support of local, state, and federal agencies is essential to the success of many watershed protection initiatives. The MDC and the MWRA will seek to ensure that other agencies and entities appropriately carry out their duties and responsibilities to preserve environmental quality and water resources within the watersheds. Positive actions in this regard include the inclusion of the Wachusett watershed in a five-year program sponsored by the USDA to reduce non-point source pollution, a joint DEP-MDC study on

the impacts of storm water on a major tributary, stronger regulations on septic systems proposed by DEP, and the formation of the “Wachusett Task Force” to facilitate inter-town communication and coordination on common issues facing health and planning boards. The jointly funded sewerage project for portions of Holden and West Boylston discussed in Watershed Protection Project (#2104) is an excellent example of this effort. Other opportunities to increase participation and funding by outside agencies will be pursued.

Pilot and Demonstration Treatment Studies

An initial Pilot Treatment Program study was completed in 1993 to evaluate alternative filtration, disinfection, and corrosion control processes and determine which were most appropriate for MWRA source waters. A small scale demonstration water treatment plant was constructed to optimize and confirm the recommended and DEP approved treatment processes based on pilot plant results, to acquire more information on backwash and solids disposal issues, and to produce design data necessary for the future design of the full scale plant. The demonstration plant, began operations in 1994 and completed operations in September 1995. The demonstration plant results proved that it is possible to produce comparable water quality at a higher treatment rate than the DEP approved rate. The higher treatment rate will reduce the overall capital cost of the water treatment plant. A request to revise the DEP approved rate is being sought. The demonstration plant results were incorporated into an updated study that identified potential locations for constructing treatment facilities. This study will be updated when additional information on federal and state standards becomes available, and will include a more detailed assessment of the forthcoming Disinfection By-Products Rule.

Environmental Review and Conceptual Design

The EIR and Conceptual Design for the treatment plant included environmental reviews, data collection and analyses, and facility designs which support the dual track compliance approach. To promote the non-filtration track, more information was developed on how the Wachusett Reservoir and watershed function as a system, the causes of the reservoir’s historic inability to meet the filtration avoidance criteria, and what actions could be taken to rapidly improve water quality. For both the filtration and non-filtration tracks, detailed siting and environmental studies were conducted and conceptual designs were prepared for potential facilities. The Conceptual Design Reports contain life cycle cost analyses, process design criteria, site plans, plant hydraulics, and additional design specifications.

Walnut Hill Water Plant

The Walnut Hill Water Treatment Plant is being designed as three alternative plants: 1) Chlorine/Chloramination, 2) Ozone/Chloramination, and 3) DPF/Ozone/Filtration/Chloramination. All three alternatives include raw water pumping, a 50-million gallon clearwell for finished water storage, corrosion control facilities, an administration building, and raw and finished water connections. The three alternatives are being designed in a modular fashion so that construction of facility alternatives can proceed additively from alternative 1 to 2 to 3 if necessary. All three alternatives will be designed to the 90 percent level and a decision on which to build will be made in mid-1998.

The recommended compliance plan assumes ozonation as the primary disinfectant. The ozonation facility will consist of an ozone generator, ozone contact chambers, and ozone feed equipment. It is assumed that the permanent corrosion control facility will use lime and carbon dioxide, and will consist of lime silos, slakers and feed equipment, and carbon dioxide storage and handling equipment.

Design and Construction Management Support

The Walnut Hill Water Treatment Plant is a major and complicated project proceeding under a DEP Consent Order schedule. Management support services during the design and construction phases are needed to assist MWRA staff. Professional services for the design and value engineering review will be procured from an engineering firm having resources and expertise for these tasks. A consulting firm will provide construction management support on-site during construction.

Interim Corrosion Control

In order to comply with the EPA Lead and Copper Rule's action level for lead at consumers' taps, the MWRA is required to have in operation a facility by January 1997 to reduce the corrosivity of Wachusett Reservoir water for the interim period prior to the completion of a permanent treatment plant. The facility is located in Marlborough near Cosgrove Aqueduct Shaft C and was completed in mid-1996. The new facility feeds primarily soda ash and carbon dioxide into the water to reduce acidity, thereby decreasing the potential for leaching lead from household plumbing, and inhibiting internal pipe corrosion.

Norumbega Covered Storage

Open reservoirs within the water distribution system are considered primary water supply sources under the Safe Drinking Water Act and are therefore subject to the Surface Water Treatment Rule. State regulations require that all open distribution reservoirs be covered to prevent airborne, land, and waterborne contamination. The MWRA's long-term plan is to eventually provide approximately 460 million gallons of enclosed storage at various locations throughout the system. This quantity represents approximately one day of maximum demand.

This CIP includes only those storage facilities scheduled to start construction by 2006 and which will provide a total of 260 million gallons of storage. The Drinking Water Quality Improvements (Wachusett) project includes a 50-million gallon clear well at the treatment plant and a 115-million gallon storage facility at Norumbega Reservoir. Norumbega Reservoir is expected to be maintained to provide a minimum of 75 million gallons of open storage for emergency back-up. Additional covered storage is proposed in other projects, including 25 million gallons at the Nash Hill Reservoir (Project #2102 Drinking Water Quality Improvements (Quabbin)), 20 million gallons at the Weston Reservoir (Project #2201, MetroWest Water Supply Tunnel), 20 million gallons at the Fells Reservoir (Project #2323, Spot Pond Pump Station Rehabilitation), and 30 million gallons at Blue Hills (Project #2313, Blue Hills Covered Storage).

Scope

Phase	Scope
Study 1	Investigate the potential impacts of SDWA amendments on the MWRA system and evaluate the need, feasibility, and benefits of improved treatment processes.
Study 2	Evaluate alternative filtration, disinfection, and corrosion control processes to determine which were most appropriate for MWRA source waters. A pilot plant was constructed and operated at the Wachusett Reservoir to allow testing of various treatment technique combinations. Identify potential locations for constructing treatment facilities.
Crypto Inactivation Study	Determine the efficacy of inactivating <i>Cryptosporidium</i> in Wachusett Reservoir source water using recommended disinfectant alternatives chlorine/chloramine and ozone/chloramine, and develop design criteria for full-scale disinfection contacting systems through bench-scale disinfection experiments.

Distribution Water Quality Study	Investigate distribution water quality issues in connection with MWRA plans to upgrade corrosion control and disinfection and provide the MWRA with a sampling program to monitor water quality in order to refine the treatment.
DEP Fees	Fees for approval of treatment processes.
Technical Assistance	Technical assistance for the water treatment plant, Norumbega covered storage, and interim corrosion control facilities.
WTP: EIR/Conceptual Design	Environmental reviews, data collection and analyses, facility designs which will support the dual track compliance approach, evaluation of design criteria, site plans, plant hydraulics, and construction of a small scale demonstration water treatment plant were completed.
WTP: Design/CA/RI	Design, Construction Administration, and Resident Inspection for a 450 mgd water treatment plant and other associated components.
WTP: Construction	Construction of a 450 mgd water treatment plant, chemical feed equipment, a 50 million gallon clear well for storage, an administration building, and new raw water and finished water connections .
WTP: Design Mgmt Support	Professional service and value engineering support to MWRA staff in the design of the water treatment plant.
WTP: Construction Mgmt Support	Construction management support on-site during construction of the proposed water treatment plant.
Norumbega: Preliminary Design/EIR	Environmental reviews, data collection and analyses, and preliminary designs for covered storage at Norumbega Reservoir which support the dual track compliance approach for the water treatment plant.
Norumbega: Des/CA/RI	Design, Construction Administration, and Resident Inspection of a 115 million gallon covered storage facility at the Norumbega Reservoir.
Norumbega: Construction	Construction of a 115 million gallon covered storage facility at the Norumbega Reservoir.
Land	Land acquisition for Norumbega Covered Storage. <i>This is the subject of on-going negotiation with the Town of Weston.</i>
Appraisal	Appraisal of land for Norumbega Covered Storage.
Interim Corrosion Control: Design/CA/RI	Design of a facility to comply with the EPA Lead and Copper Rule and to reduce corrosivity of the Wachusett Reservoir water for the interim period prior to the completion of a permanent treatment plant.
Interim Corrosion Control: Construction	Construction phase of project described above.

Interim Corrosion Control: Construction-Northborough	Construction of a small potassium hydroxide injection facility at the Hudson Pump Station to provide interim corrosion control to MWRA water supply to Northborough until a permanent plant is in place.
Equipment Purchase	Purchase of a bucket truck for operation and maintenance of the interim corrosion control silos.

Changes in Scope Since FY96-98 CIP

Phase	Change
Appraisal	Appraisal of land for Norumbega Covered Storage.
Land	Land Acquisition for Norumbega Covered Storage.
Crypto Inactivation Study	New phase.
Distribution Water Quality Study	New phase.
ICC Construction Northborough	New phase.
Equipment purchase	New phase.

CEB Impact

The estimated annual costs of operating a water treatment plant and corrosion and disinfection facilities range from \$20 million to \$24 million. An estimate of the operations and maintenance costs for the new plant will be developed in the design phase. Following are incremental costs for only the Interim Corrosion Control Facility:

CEB line item	Incremental cost in FY 98	Description
Labor		
Chemical		
Gas		
Electricity		
Supplies		
Maintenance	\$20,000	
Total	\$20,000	

2102. Drinking Water Quality Improvements (Quabbin)

Purpose To improve the quality of drinking water delivered to the three Chicopee Valley Aqueduct communities of Chicopee, Wilbraham, and South Hadley Fire District No. 1. Improvements will include covered storage at Nash Hill Reservoir and a water treatment facility for Quabbin Reservoir water.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Nash Hill Covered Storage:			
Design/CA/RI	\$1,524	Jan 93	Oct 99
Construction	\$10,345	Nov 97	Oct 99
Quabbin Water Treatment Facilities:			
Design/CA/RI	\$2,260	May 95	Jul 00
Construction	\$2,246	Aug 98	Jul 00
Land	\$52	Jul 96	Aug 98
DEP Permit Fees	\$5	Jul 96	Aug 98
TOTAL:	\$16,432		

**Project
History and
Background**

Currently, the MWRA provides water to the three Chicopee Valley Aqueduct (CVA) communities under long-term contracts with specific termination dates of 1998 (South Hadley) and 2000 (Chicopee and Wilbraham). The rates paid to the MWRA under these contracts are less than ten percent of the current prevailing rate, and cannot be changed prior to the termination dates in the contracts. At that time, the MWRA and the communities will negotiate new water supply agreements under the Authority's Regulations for the Continuation of Contract Water Supply. The regulations require a ten-year term and payment of the prevailing rate.

In December 1991, the Board of Directors authorized staff to develop, for Board approval, Memoranda of Understanding (MOU) with Chicopee, South Hadley Fire District No. 1, and Wilbraham for the interim period until their contracts are renewed, stating that the MWRA will assume responsibility for meeting federal and state drinking water standards for water supplied through the CVA. In the interim, the Winsor chlorination station has been rebuilt to serve as a temporary disinfection facility. Chicopee and South Hadley Fire District No. 1 have signed the MOUs. Negotiations continue with Wilbraham. No final design or related work for South Hadley and Wilbraham will be undertaken until the MOUs have been signed.

Quabbin Reservoir is currently the source of water to the three Chicopee Valley Aqueduct communities. The Massachusetts DEP granted a conditional waiver from filtration for Quabbin Reservoir water. A Consent Order covering activities to support the continuation of the filtration waiver was signed in December 1991. The consent order schedule for design and construction of permanent disinfection and corrosion control facilities, which are needed to comply with the federal and state drinking water standards, was submitted to DEP in February 1994. The approved treatment processes for disinfection and corrosion control are chlorination for primary disinfection, chloramination for residual disinfection, and lime/carbon dioxide for corrosion control. The publication of new draft regulations for the Enhanced Surface Water Treatment Rule and Disinfectant/Disinfection By-Products Rule, and discussions regarding a possible *cryptosporidium* rule have raised questions regarding the efficacy of this treatment technology.

An action plan was developed to account for the possibility of future treatment requirements. A life cycle cost analysis found that the chlorine/chloramine option is the most cost effective, even if additional treatment is required as soon as two years later. The project budget is based on chlorination and chloramination. Ozonation facilities or other treatment processes may be ultimately required.

Because the City of Chicopee recently constructed and placed into operation its own corrosion control facility, it may not be desirable or practical for the MWRA to build a central corrosion control facility to serve all three communities. It may prove to be more cost-effective to construct two smaller facilities, one each for Wilbraham and South Hadley Fire Department No. 1, assuming both sign MOU's. A feasibility study and LCCA will be conducted to identify the most cost-effective alternative. It is anticipated that baking soda/soda ash would be utilized for the small corrosion control facilities if constructed by the MWRA.

However, the construction budget does not include funds for the two satellite corrosion control facilities and will not until both Wilbraham and South Hadley signed MOUs with the MWRA.

Open reservoirs within the water distribution system are considered primary water supply sources under the Safe Drinking Water Act and are therefore subject to the Surface Water Treatment Rule. State regulations require that all open distribution reservoirs be covered to prevent airborne, land, and water-borne contamination. In order to comply with the December 1991 consent order between the MWRA and the Massachusetts Department of Environmental Protection (DEP), the MWRA must provide covered distribution storage at the Nash Hill Reservoir.

Nash Hill Reservoir is a single, undivided, uncovered, man-made basin that is connected to the Chicopee Valley Aqueduct in the Town of Ludlow. The reservoir was constructed in 1950, and provides distribution storage and hydraulic control for water supplied from Quabbin Reservoir to Chicopee, Wilbraham, and South Hadley Fire District No. 1. Nash Hill Reservoir has a total capacity of approximately 25 million gallons, a surface area of approximately five acres, and a maximum depth of approximately 20 feet. This open reservoir is proposed to be replaced by two 12.5 million gallon covered tanks.

Construction of an interim disinfection facility at Winsor Dam has been funded by the MWRA, at no additional charge to the three CVA communities. When their current contracts expire, the three CVA communities will reimburse the MWRA for any debt service and operating costs relating to study, design, and construction of additional treatment facilities for Quabbin Reservoir and covered storage at Nash Hill Reservoir.

Scope

Phase	Scope
Nash Hill: Preliminary Design	Study to determine the most suitable type of covered storage, and preliminary design of preferred alternative.
Nash Hill: Design/CA/RI	Design, construction administration, and resident inspection of two covered storage facilities.
Nash Hill: Construction	Construction of two pre-stressed, precast 12.5 million gallon flat roof storage facilities at the reservoir.

Quabbin WTP: Design/CA/RI	Design, Construction Administration, and Resident Inspection for a corrosion control facility, and a disinfection facility.
Quabbin WTP: Construction	Construction of a corrosion facility, and a disinfection facility.
DEP Permit Fee	Department of Environmental Protection permit fees for required construction.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Quabbin Water Treatment Plant	Chlorine and chloramine was chosen as the preferred alternative for the treatment plant.

CEB Impact

CEB Line item	Incremental Cost in FY00	Description
Chemicals	\$3,000	
Utilities	\$10,000	Quabbin Water Treatment Plant utilities
Total	\$13,000	

2104. Watershed Protection

Purpose

To develop watershed protection plans and implement protection measures for the MWRA/MDC reservoir system. This project consists of two components: a Sudbury Reservoir Water Protection Plan, and the MWRA's contribution to the MDC's Wastewater Facilities Plan for the Wachusett Reservoir watershed. There currently is no water quality management or protection plan for the Sudbury Reservoir system, which is MWRA's only back-up supply, and threats to water quality have proliferated in the past two decades. The protection plan to be completed by July 1, 1996, will provide guidance to the MDC on future policy and management decisions regarding water quality protection of the Sudbury Reservoir system. The wastewater facilities plan consists of providing sewer service to critical portions of the towns of Holden and West Boylston to protect Wachusett Reservoir water quality.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Holden/W. Boylston Sewer	\$8,500	Jul 96	Jun 00
Study	\$92	Apr 95	Apr 97
TOTAL:	\$8,592		

Project History and Background

Sudbury Reservoir Watershed Protection Plan

The Sudbury Reservoir system, which includes the main reservoir and Framingham #3, is the only back-up water service in the MWRA system. The reservoirs are located in Southborough, Marlborough, and Framingham, and their watersheds incorporate portions of Westborough, Northborough, and Ashland. Although the Sudbury Reservoir has been on reserve status since 1974, it remains an essential emergency response component for the waterworks system.

It could function either as a direct source of supply to the metropolitan area for up to one month (in case of an interruption in flow from Wachusett Reservoir) or as a transmission channel to convey a mixture of Wachusett-Sudbury water through to the Sudbury Aqueduct or Weston Aqueduct (in case of a failure along the Hultman Aqueduct).

The Sudbury Reservoir has a long history of water quality problems, and any contemporary use of the reservoir for drinking water purposes would probably trigger issuance of a public health advisory and/or boil order. Furthermore, since its deactivation in 1974, there has been little attention to watershed protection around the reservoir. As a result, the watershed has become more developed during the past two decades and sources of pollution of the reservoir have increased. These factors have raised concerns about the long-term viability and usefulness of the Sudbury Reservoir as a drinking water resource.

West Boylston/Holden Sewer

The Metropolitan District Commission (MDC) is implementing a \$58 million wastewater facilities plan for portions of Holden and West Boylston in the Wachusett Reservoir watershed. A wastewater collection system will replace failing or marginal septic systems in the area and has been identified as a top watershed protection priority by MWRA, MDC, DEP, and EPA. A total of 72 miles of sewer pipe is planned, with sewage conveyed to and treated at the Upper Blackstone Water Pollution Control Facility.

A cost sharing formula was approved between the Commonwealth of Massachusetts, the towns of Holden and West Boylston, and the MWRA in the fall of 1995, after six months of negotiations.

Scope

Phase	Scope
Reservoir Protection Study	Document current conditions in the watershed and develop a reasonable strategy for maintaining acceptable water quality in the Sudbury Reservoir.
West Boylston / Holden Sewer	Payment for the MDC's wastewater facilities plan in the Wachusett Reservoir Watershed.

**Changes in
Scope
Since FY96-
98 CIP**

Phase	Change
West Boylston/Holden Sewer	Payment for the MDC's wastewater facilities plan in the Wachusett Reservoir Watershed.

CEB Impact None.

2201. MetroWest Water Supply Tunnel

Purpose To provide transmission redundancy for the Hultman Aqueduct to ensure reliable water delivery and provide sufficient hydraulic capacity to support the new Walnut Hill Water Treatment Plant and new covered storage distribution facilities. This project consists of construction of a 17.5 mile deep rock tunnel from Shaft C in Marlborough to Shaft 5 of the City Tunnel in Weston.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Study	\$415	Jun 84	Oct 89
Construction Sudbury Pipe Bridge	\$295	Nov 91	Jun 92
Hultman Study	\$1,079	Apr 95	Feb 06
Hultman Leak Repair	\$330	Jul 96	Aug 96
Hultman Repair Band	\$20	Jun 96	Jun 96
Design/EIR/Engineering Services During Construction	\$32,170	Apr 92	Feb 04
Construction Management/RI	\$31,593	Apr 95	Feb 04
Construction Contracts 1 - 5	\$536,483	Jun 96	Feb 04
Land Acquisition	\$6,295	Oct 95	Jun 05
Local Supply Contingency Design/CA/RI	\$740	May 96	Nov 98
Local Supply Contingency Construction	\$4,212	Sep 97	Nov 98
Local Supply Contingency Plan Legal/Easements	\$94	May 96	Nov 98
Community Technical Assistance	\$395	Jun 95	Apr 98
Professional Services	\$500	Nov 95	Jun 99

DEP Permit Fees	\$45	Oct 94	Aug 97
Framingham MOU	\$2,547	Apr 96	Jun 03
Owner Controlled Insurance	\$19,741	Jun 96	Feb 04
Technical Assistance	\$71	Jun 84	Feb 06
TOTAL:	\$637,025		

**Project
History and
Background**

The MWRA's water delivery depends on a system of tunnels and aqueducts which transport water from the Quabbin and Wachusett Reservoirs to the distribution reservoirs in western metropolitan Boston. The existing tunnels and aqueducts are deficient in several respects. First, the transmission system is unable to supply sufficient hydraulic capacity during peak flow periods, leading to pressure deficiencies in all high service areas during the summer months. Secondly, key sections of the transmission system, such as the Hultman Aqueduct and the Southborough Tunnel, rely on only a single conduit. In the event of failure of any of the major transmission sections, the remaining waterworks system could not meet the demand for water.

Redundancy planning and the need to provide adequate transmission capacity to support the Waterworks integrated system plan for improving drinking water quality is the prime reason for transmission system improvements. This plan includes the construction of the new Walnut Hill Water Treatment Plant and new covered storage distribution facilities.

One aspect of this project is to provide reasonable levels of redundancy along the major supply routes required to ensure reliable service delivery, and to construct the MetroWest Water Supply Tunnel and its extension to the Weston Aqueduct Terminal Chamber, to provide the critically needed minimum level of transmission redundancy for the Hultman Aqueduct. Redundancy for the City Tunnel and the City Tunnel Extension will be planned for as part of the Northern Tunnel Loop (Project #2204). Redundancy will also enhance system maintenance by allowing each major supply conduit to be taken out of service for inspection, cleaning, and repair.

The project consists of study of the aqueduct/tunnel system; EIR, design, and replacement of the Sudbury Aqueduct and the Weston Aqueduct with the MetroWest Tunnel; design and construction of the new Weston water storage facility; and a condition assessment study of the existing Hultman Aqueduct.

The Marlborough, Southborough, Framingham, Wellesley, Needham, and Weston distribution systems are supplied in part or entirely by pumping stations which take suction from the Hultman Aqueduct. The Town of Northborough and Westborough State Hospital, which both take water from the Wachusett Aqueduct, also require alternative connections. As part of the redundancy program, an alternative means of delivering water to these users is essential so that the Hultman may be taken off line for inspection, maintenance, and repair.

The MetroWest Tunnel will provide a redundant supply to these users. The siting of the Water Treatment Plant may also influence how some of these communities will be served in the future.

In June 1989, the Authority began engineering work on the reconstruction of the Sudbury Aqueduct. Design began as an evaluation of three options: surface reconstruction of the Sudbury Aqueduct with a ten-foot diameter pipe or equivalent with new tunnels to connect it to the existing aqueduct system; tunnel alternatives to the pipe in areas of dense urban development or other sensitive areas such as wetlands, hazardous waste sites, etc.; and, an all-tunnel alternative for the entire length of the project.

On May 9, 1990, the Board of Directors directed staff to put minimum effort into further study of the reconstruction of the Sudbury Aqueduct and maximum effort into study of the all-tunnel alternative. The advantages of tunneling include a large reduction in surface activities resulting in a reduced environmental impact, and the potential to obtain a large increase in water transmission capacity which will enable the tunnel to supplant the Weston Aqueduct as well as the Sudbury Aqueduct. Other advantages include a higher pressure rating by constructing a tunnel deeper into rock, and the ability to construct along a straight line thus reducing the overall length of the project by three miles.

In November 1990, the Board of Directors directed staff to eliminate the planned tunnel from Norumbega Reservoir to the Chestnut Hill Reservoir in favor of extending the MetroWest Tunnel from the Norumbega Reservoir to Shaft 5 of the City Tunnel and to the eastern end of the Weston Aqueduct. The extension will allow the Weston Aqueduct and Weston Reservoir to be taken off-line and used only for emergency supply as required by the Safe Drinking Water Act.

Program Elements

The MetroWest Tunnel Project consists of a new 14-foot diameter, 17.5-mile long tunnel. The tunnel will extend from the proposed water treatment plant site at Walnut Hill to Shaft 4 of the Hultman Aqueduct in Southborough. From there, the tunnel will continue to a "tee" connection east of Norumbega Reservoir. The tunnel will continue from the "tee" in an eastward direction to Shaft 5 of the City Tunnel and northward to the Weston Aqueduct Terminal Chamber. The tunnel depth will vary from 200 to 500 feet below ground surface along the alignment.

Surface distribution facilities, including piping, valve chambers, and risers, will connect the tunnel to the Hultman Aqueduct and local community services. Intermediate connections between the MetroWest Tunnel and the Hultman Aqueduct will permit operating segments of either the aqueduct or the tunnel interchangeably, allowing flexibility in the maintenance of the two conduits.

Disposal of Tunnel and Shaft Excavate

Construction of the MetroWest Tunnel will produce more than 1.4 million cubic yards of rock excavate. All 340,000 cubic yards removed from Shaft E will be hauled offsite by truck. At Shaft L, the current plan is to store all 850,000 cubic yards on a portion of the site. Approximately 200,000 cubic yards will be removed from Shaft 5A, mostly from excavation for the 20-million gallon storage tanks. All of the rock from Shaft 5A will be hauled offsite by truck.

The MetroWest Tunnel and the proposed version of the Northern Tunnel Loop are illustrated on the last page of the narrative for this project.

Scope

Phase	Scope
Study	Study of the aqueduct/tunnel system to determine the best course of action to improve hydraulic capacity and create redundancy.
Construction-Siphon Pipe Bridge	Rehabilitation of the Siphon Pipe Bridge at the Weston Aqueduct which experienced significant leakage.
Design/EIR-Tunnel	Environmental impact process and design of the 17.5-mile long, 14-foot diameter tunnel.

Engineering Services During Construction (ESDC)	ESDC will provide for complete construction support services, including environmental and safety compliance, claims assistance, contract administration, quality assurance testing, and community relations.
Construction: Tunnel Contract 1	Contract 1 consists of the western portion of the tunnel alignment and associated surface facilities. Shaft E will be constructed at the Sudbury Dam and a tunnel will be excavated 4.7 miles to Shaft D, located adjacent to the clear well of the Walnut Hill Water Treatment Plant (WTP). A riser shaft will be constructed to connect the tunnel to Southborough's Hosmer Pump Station. The surface piping facilities necessary to bring water from the Wachusett Aqueduct and the Cosgrove Tunnel to the WTP, and those necessary to connect the WTP to the Hultman Aqueduct and Shaft D of the MWWST, will be part of the WTP project. A shaft east of Shaft D will connect the tunnel to the Hosmer Pump Station in Southborough. At Shaft E, a valve chamber and piping will be constructed to connect the MetroWest Tunnel to the Hultman Aqueduct at Shaft 4. Connections will also be provided to the headworks of the Weston Aqueduct.
Construction: Tunnel Contract 2	Approximately 11.9 miles of tunnel between Southborough and Weston will be constructed under this contract. The construction will be staged from Shaft L, which is centrally located at a sand and gravel pit in Framingham, where a permanent connection to the Hultman will be constructed. Along the alignment, four small-diameter shafts will be constructed for community connections to Framingham and Weston. The western reach of the Contract 2 tunnel will terminate at Shaft E. The eastern reach will terminate at the "tee" of Shaft W and Shaft 5A. Shafts NE and NW will be constructed on the east side of Norumbega Reservoir. Surface work under this contract will include valve chambers and surface piping to allow connections to the Hultman Aqueduct and Norumbega Reservoir. The design includes provisions for future connections to the Norumbega Covered Storage facility and the proposed Northern Tunnel Loop.
Construction: Tunnel Contract 3	Contract 3 includes the eastern portion of the tunnel alignment. Tunnel construction will be staged from Shaft 5A, located near the intersection of Route 128 and the Massachusetts Turnpike. From Shaft 5A, an approximately 2,000-foot long, 12-foot finished diameter tunnel will be constructed westward to connect to the Contract 2 tunnel. From this connection, an approximately 2,500-foot long, 12-foot finished diameter tunnel will be constructed to Shaft W, located adjacent to the Weston Aqueduct Terminal Chamber. Surface facilities constructed at the Shaft W site will include a 20-million gallon storage facility that will replace the function of the existing Weston Aqueduct/Weston Reservoir system. This will allow the Weston Aqueduct/Reservoir system to be taken off line and placed on emergency stand-by status. The storage facility will be constructed as two concrete tanks partially buried in a hillside adjacent to Shaft W. Connections will be made under this contract at Shaft W to

Construction: Tunnel Contract 3 continued	three WASM Low Service mains and a single WASM High Service main, as well as to the seven-foot diameter branch of the Hultman Aqueduct. Other surface works that will be constructed under this contract include connections between Shaft 5A of the MetroWest Tunnel and Shaft 5 of the City Tunnel, and to service connection that feeds Wellesley and Needham.
Construction: Tunnel Contract 4	Filed sub-bid work for the MetroWest Tunnel project has been grouped under one contract. This includes work at Norumbega Reservoir such as chemical feed facilities, an intake structure and piping to provide interim connections to the Reservoir, and associated road work. The interim connection is necessary until the Norumbega Covered Storage facility is placed in operation.
Construction: Tunnel Contract 5	Massachusetts Highway Department (MHD) salt storage operations will be transferred from the Shaft 5A site to a new, nearby location on MHD property on Recreation Road in Weston. This will allow the MHD salt sheds currently located at the Shaft 5A site to be demolished. New salt storage sheds and site grading work will be completed under this contract at the Recreation Road site. MHD office trailers presently located at the Shaft 5A site will be relocated to the Recreation Road site.
Construction Management/ Resident Inspection	The scope of the services will be sufficient to provide full inspection of all construction elements. The scope will also provide for complete construction support services, including environmental and safety compliance, claims assistance, contract administration, quality assurance testing, and community relations. The CIP also includes funds for the design engineer to provide engineering services during construction. The design engineer will be responsible for reviewing technical submittals by the construction contractor and providing technical assistance relative to the original design.
Hultman Study	Risk analyses to determine which leaks should be repaired now and a monitoring plan for leaks which presently do not threaten the integrity of the aqueduct.
Hultman Leak Repair	Test pit excavation and leak repair on the Hultman Aqueduct.
Hultman Repair Band	Purchase of external repair band for Hultman Aqueduct repair.
Land Acquisition	Easements along the 17.5 mile tunnel construction route, as well as land at the Shaft W site.
Professional Services	Services required such as: construction safety, contractor audit, legal services, risk management consulting services, and other miscellaneous services.
Community Technical Assistance	Funds to assist communities with the planning and redesign of utility plans.

Local Water Supply Contingency Design/CA/RI	Design of a Water Supply Contingency Plan which will include the installation of new local mains where residential well supplies could be affected by tunnel construction.
Local Water Supply Contingency Construction	Construction of a Water Supply Contingency Plan, including the installation of local mains where residential well supplies are affected by tunnel construction. This phase includes funds for reimbursement of water services.
Local Water Supply Contingency Easements	Legal easements necessary for the Water Supply Contingency Plan.
Owner Controller Insurance	Owner controlled insurance program providing worker's compensation, general liability and pollution liability insurance for the MetroWest construction contracts 1 - 5.
Framingham MOU	Funds to mitigate the impacts of the construction of the MetroWest Water Supply Tunnel with the Town of Framingham.

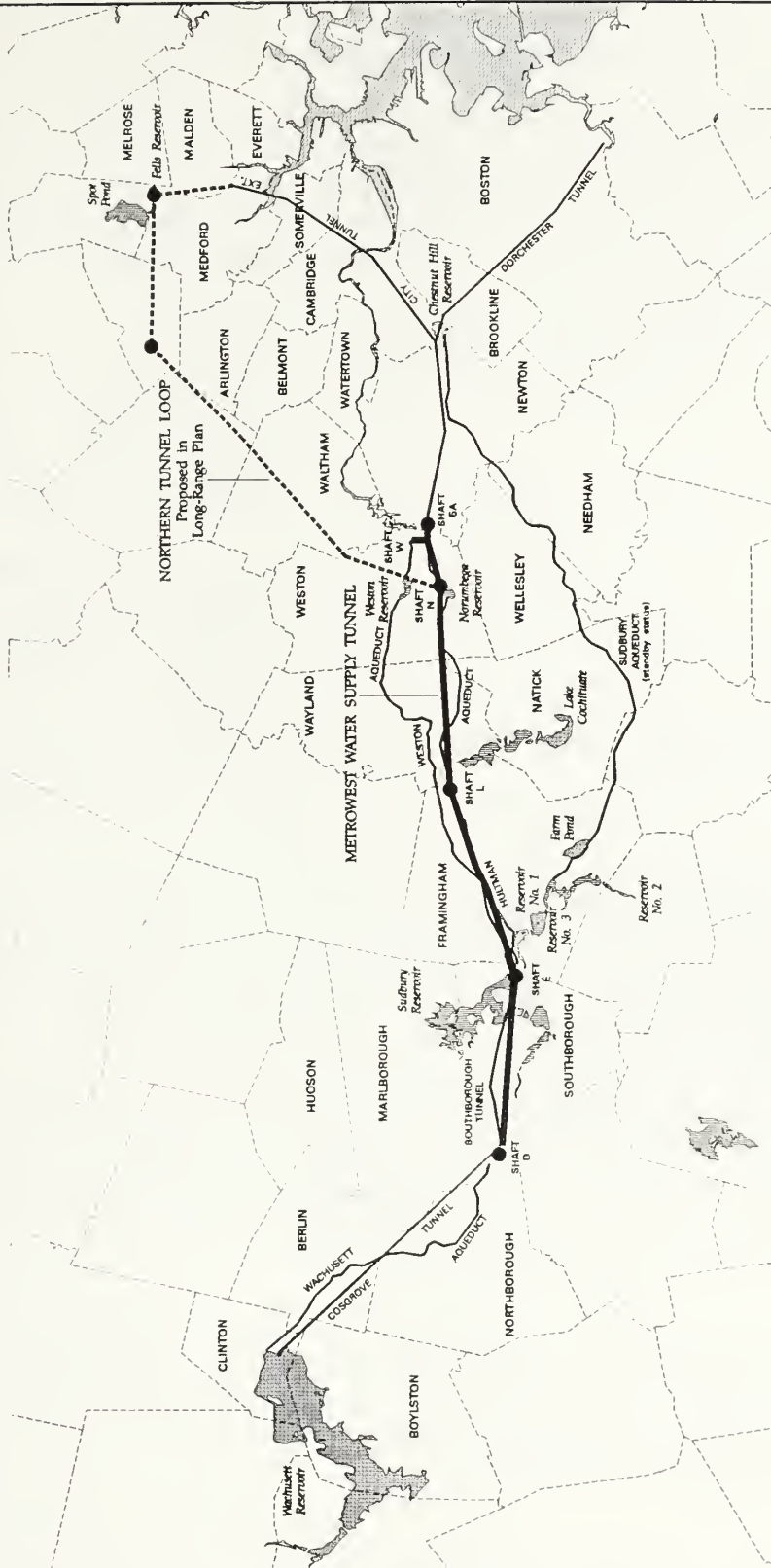
**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction Contracts 1-5	Design scope changes. Tunnel contracts 1,3,4, and 5 inflated to the mid-point of construction to reflect likely bid prices.
Professional Services	New phase.
Local Water Supply Contingency Construction	New phase.
Local Water Supply Contingency Legal Easements	New phase.
Hultman Leak Repair	New phase.
Hultman Repair Band	New phase for equipment purchase.
Owner Controller Insurance	New phase for insurance for construction contracts 1 - 5.

Framingham MOU	New phase for funds necessary for mitigation with the Town of Framingham.
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CEB Impact None.

Transmission System Redundancy Plan



Metrowest Tunnel Construction Contract Breakdown:

- No. 1 Tunnel from Shaft D to Shaft E
- No. 2 Tunnel from Shaft E to the 'wye' east of Norumbega
- No. 3 End portion of tunnel including Shafts 5A and W, and Weston Tanks
- No. 4 Filled Sub-bid work at Shafts D and N
- No. 5 Relocation of MHD salt sheds at Shaft 5A

2202. Dam Control Valve Replacement

Purpose To improve the safety and operability of water release valves which are necessary for flood control functions and minimum streamflow requirements. Improvements will involve replacement of valves at Sudbury Reservoir in Southborough and at the Wachusett Dam.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design	In-house	Feb 90	Mar 97
Construction	\$1,829	Dec 93	Feb 98
TOTAL:	\$1,829		

**Project
History and
Background**

The MWRA is responsible for the operation and maintenance of the outlet control valves at the Wachusett Dam and Sudbury Reservoir in Southborough. The valves are used for flood control releases as well as for filling the Wachusett Aqueduct, which serves Northborough and Westborough State Hospital, and under emergency conditions would flow into the Hultman Aqueduct. In the past, both the Division of Waterways and the U.S. Army Corps of Engineers have cited the poor condition of the valves and the need to restore operability for flood control. Failure to make repairs could lead to the downgrading of future safety condition assessments of the Wachusett Dam by the Corps of Engineers, as well as increase the risk of casualties and property damage if flood conditions should arise.

There are eight 24-inch valves which control the water releases from the Sudbury Reservoir in Southborough. The valves were installed in 1841 to allow water to be released to either the Weston Aqueduct or Framingham Reservoir No. 3. The inoperable valves presently affect both routine operation and emergency flood control.

Scope

Phase	Scope
Design - Wachusett	Design for the replacement of eight 24-inch diameter and four 48-inch diameter outlet control gate valves.
Construction - Wachusett	Replacement of eight 24-inch diameter and four 48-inch diameter outlet control gate valves.
Design - Sudbury	Design for the replacement of eight 24-inch valves.
Construction - Sudbury	Replacement of eight 24-inch valves.

Changes in Scope Since FY96-98 CIP None.

CEB Impact None.

2203. Sluice Gate Rehabilitation

Purpose To improve the condition and operability of sluice gates used for regulating inflows and outflows at various reservoirs. More than 50 manual gates will be replaced by motorized gates at Wachusett Reservoir, Sudbury Reservoir, Framingham Reservoir, and various distribution reservoirs.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$670	Aug 88	Aug 03
Construction	\$5,261	Dec 88	Aug 03
TOTAL:	\$5,931		

**Project
History and
Background**

The Waterworks Division is responsible for the maintenance and operation of the sluice gates at reservoirs located throughout the system. The existing gates are typically 80 - 100 years old, are in poor condition, and must be operated by hand. Problems include gate leakage and corroded tracks which can prevent operation of the gates. The sluice gates regulate water supply intake and release to downstream rivers in accordance with both legislative and flood control requirements. In a Dam Safety Inspection Report by the Army Corps of Engineers, the sluice gates at Wachusett Reservoir and the four Sudbury System Reservoirs were cited as needing repairs to restore operability for flood control use. Failure to make repairs could lead to Corps downgrading of future dam safety assessments at these sites. Other distribution reservoir sites such as Spot Pond and Fells Reservoir also need sluice gate rehabilitation to improve operations.

Scope

Phase	Scope
Design - Stop Planks	Design of the stop planks for all sites.
Construction - Stop Planks	Construction of stop planks at all sites (required to de-water the wet wells) before the sluice gates can be installed.
Design/CS/RI 1	Design the installation of motorized operators, upgrade of the gate houses, and replacement of gates and sliding tracks at Wachusett Reservoir, Sudbury Reservoir, and Framingham Reservoir 3.
Construction 1	Installation of motorized operators, upgrade of gate houses, and replacement of gates and sliding tracks at Wachusett Reservoir, Sudbury Reservoir, and Framingham Reservoir 3.
Design 2	Design the installation of motorized operators, upgrade of the gate houses, and replacement of approximately 30 gates and sliding tracks at various distribution reservoirs.
Construction 2	Installation of motorized operators, upgrade of gate houses, and replacement of approximately 30 gates and sliding tracks at various distribution reservoirs.

**Changes in
Scope
Since FY96-98
CIP**

None.

CEB Impact

None.

2204. Northern Tunnel Loop

Purpose

To provide full redundancy for the City Tunnel and the City Tunnel Extension in order to ensure reliable transmission capabilities and allow for inspection, maintenance, or repair of these facilities if required. Current plans recommend a closed loop tunnel system, as originally planned in 1936 by the system's designers, created by constructing a 16.5-mile deep rock tunnel from Norumbega Reservoir in Weston to Fells Reservoir and the City Tunnel Extension.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Feasibility Study/Survey	\$214	Jun 98	Dec 99
TOTAL:	\$214		

Project History and Background

When the pressure aqueduct system was planned in 1936, it was envisioned that the tunnel within the metropolitan area would be configured as a loop consisting of several segments so that any section could be deactivated while the others remained in service. This tunnel system was initially to have a northern loop and ultimately a southern loop.

The City Tunnel and the City Tunnel Extensions have no backup facilities and cannot be removed from service for inspection, maintenance, or repair. Critical isolation valves cannot currently be exercised to keep them in good working order. The many tunnel appurtenances which connect the tunnel shafts to the surface piping are now 30 to 40 years old and will become more prone to malfunction with increasing age. Failures of critical appurtenances could necessitate a tunnel shut down with a possible outage of water service over a widespread area.

Although the Shaft 7 to WASM 3 pipeline project and the rehabilitation of WASM 4 will provide partial redundancy, the Northern Tunnel Loop is necessary to obtain total redundancy for the City Tunnel, the City Tunnel Extension, and WASM 3. In addition, the Northern Tunnel Loop would reduce pumping costs to the Fells Reservoir and the Northern Extra High and Intermediate High areas. With the Northern Tunnel Loop in operation, WASM 3 would function as a distribution main, carrying water from the tunnel to the community meters and MWRA pumping stations. WASM 3 would still have the capacity to provide some back-up to the transmission system in the event of a tunnel failure or shut-down.

Preliminary planning estimates indicate that preliminary and final design will approximately cost \$15,623 and construction costs may exceed \$250 million.

Scope

Phase	Scope
Feasibility Study	Examine the need and provide justification for a Northern Tunnel Loop, evaluate the practicality of construction of the tunnel in phases to improve system reliability incrementally, and identify alternatives for tunnel alignment and shaft location. Identify major environmental concerns and perform reconnaissance geological assessment of possible tunnel routes.

Changes in Scope Since FY96-98 CIP

Phase	Change
Survey	Deleted phase until study is completed and project has better defined scope.
Preliminary Design/EIR	Deleted phase until study is completed and project has better defined scope.
Final Design	Deleted phase until study is completed and project has better defined scope.

CEB Impact None.

2205. Echo Bridge Rehabilitation

Purpose To address structural deterioration at Echo Bridge, which is a historic facility that carries the Sudbury Aqueduct across the Charles River. Rehabilitation work includes upgrades to the bridge facade, surface, railings, and stairways.

Expenditure Forecast and Schedule	Phase	Total Contract Amount (\$000)	Begin date	End date
	Preservation Consultant	\$14	N/A	N/A
	Design	In-house	Sep 87	on hold
	Construction	\$343	Sep 91	Sep 92
	TOTAL:	\$357		

**Project
History and
Background**

Echo Bridge carries the Sudbury Aqueduct across the Charles River. It was constructed in the 1870's and was patterned after the old Roman aqueducts consisting of a series of arched spans. The structure is a National Historic Landmark. The aqueduct bridge was constructed of concrete masonry with stone and brick facing. The stone and brick mortar joints have deteriorated and ties which secure the brick facing to the structure are failing. The railing, steel staircase, and surface walkway of the bridge also need repair.

Due to the anticipated high cost of upgrading and repairing Echo Bridge to meet applicable specifications, the MWRA has postponed the remaining railing work while outside sources of funding are explored and the neighboring communities are consulted about safety and historic preservation issues. No additional funds for construction are included in the CIP beyond those expended for repairs completed in 1992.

Scope

Phase	Scope
Preservation Consultant	Planning to insure the preservation of the historic aqueducts constructed in the 1870s.
Design - Facade	Design of the facade of the bridge which consists of a series of arched spans.
Construction- Facade	Repair and cleaning of the bridge facade and construction of a new surface topping.
Design -Railings	Design of the railings of the bridge consistent with the original architecture.
Construction Railings	Rehabilitation of the railings, steel stairways, and hand railings leading from Ellis Street, and observation deck adjacent to the Charles River, and landscaping under the bridge.

Changes in Scope Since FY96-98 CIP None.

CEB Impact None.

2206. Chicopee Valley Aqueduct Interconnections

Purpose To provide backup service connections for the three communities served by the Chicopee Valley Aqueduct (CVA) in case of a CVA failure or shutdown. Interconnections will be made to the water distribution systems of Springfield and Holyoke to facilitate emergency water transfers to Chicopee, Wilbraham, and South Hadley Fire District No. 1.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CA/RI	\$985	Jul 00	Oct 04
Construction	\$3,231	Jan 03	Oct 04
TOTAL:	\$4,216		

**Project
History and
Background**

The Chicopee Valley Aqueduct (CVA) supplies water to Chicopee, Wilbraham, and South Hadley Fire District No. 1. The 48-inch and 36-inch diameter aqueduct was built in 1949 of reinforced concrete pipe with an embedded steel cylinder. It is the only means of supplying these communities with water. The capacity of the aqueduct is 23 million gallons per day, which is just sufficient to supply the communities' peak summer demand. Although there is no known evidence of leakage or deterioration, the carrying capacity of the pipeline has been reduced somewhat due to build-up on the interior lining. It is currently not possible to perform routine maintenance without disrupting supply to these communities. Furthermore, should a breakdown occur, there is no other means of supplying these communities with water. Computer modeling indicates that if supply through the CVA is shut off, Chicopee would be without water after two days, and South Hadley and Wilbraham would be without water even sooner.

Chicopee, South Hadley, and Wilbraham pay charges under existing contracts with the MWRA that are less than ten percent of the current prevailing rate. The rates cannot be changed prior to the termination dates in the contracts. At that time, the MWRA and the communities will negotiate new water supply agreements under the Authority's Regulations for the Continuation of Contract Water Supply. The regulations require a ten-year term and payment of prevailing rate. No MWRA funds will be expended toward this project until the communities have committed to paying the prevailing rates.

Scope

Phase	Scope
Design/CA/RI	Design, construction administration and resident inspection of four interconnections to water distribution system in the non-MWRA communities. This design will facilitate transfer of up to 12 mgd to the three contract communities.
Construction	Construction of the four interconnections. The first consists of installation of 6,000 feet of 16-inch diameter water main, meter, and appurtenances to connect Holyoke to South Hadley Fire District No. 1. The second interconnection consists of installation of 6,500 linear feet of 20-inch diameter main from Springfield to Chicopee and construction of a 4.5 mgd pumping station. The third interconnection consists of replacement of valves on an existing water main between Springfield and Wilbraham. A small pumping station consisting of one 40 horse power motor pump would also be constructed to operate during a few evening hours of extreme peak demand. The fourth interconnection consists of a small pumping station allowing treated water to be transferred from Springfield's Ludlow Reservoir into the Chicopee Valley Aqueduct in an emergency.

Changes in Scope Since FY96-98 CIP None.

CEB Impact

CEB line item	Incremental cost in FY 02	Incremental cost in FY 03	Description
Maintenance	\$33,300	\$16,700	These facilities are intended for emergency use only. Annual operation and maintenance costs for the two pump stations under emergency conditions are not expected to exceed this amount.
TOTAL:	\$33,300	\$16,700	

DISTRIBUTION AND PUMPING

PIPELINE REHABILITATION PROGRAM GENERAL INFORMATION AND OVERVIEW

This section of the CIP describes 33 projects for the rehabilitation and improvement of Waterworks distribution and pumping facilities. Twenty-four of these projects involve rehabilitation of existing pipelines. These pipeline projects are part of a long-range program to restore the system's old water mains to adequate condition. An overview of this program and general information about pipeline rehabilitation needs and methods are provided here as a common preface to the specific information presented in each of the project descriptions.

To assure reliable service, distribution pipelines should be strong and durable, have clean and smooth interiors, and be large enough to pass desired flows without excessive loss of head (pressure). Key factors which typically relate to these characteristics include age, pipe material, and the coefficient of friction (commonly expressed as the C-value).

As pipes age, the effects of stress and deterioration can lead to more frequent leaks, breaks, and malfunctions of valves and other appurtenances. Pipe material composition is a factor because metal pipes lacking interior lining are particularly prone to problems such as excessive corrosion, pitting, and build up of tubercles. The presence of tuberculation is a water quality concern because bacteria can thrive among the tubercles and subsequently be released into the water. Taste, odor, and "rusty water" problems may also result from the build up of deposits. In addition, such deposits reduce the carrying capacity of a pipeline and cause friction and turbulence in the flow. C-value is the standard measure of flow resistance presented by internal pipe conditions, with higher values associated with pipes in better condition. Typically, clean pipes with smooth linings have C-values near 140, while pipes in poorer condition have C-values between 40 and 100.

Due to three decades of deferred maintenance and inadequate capital investment, the metropolitan distribution piping network requires continued rehabilitation and replacement. Presently, the median age of MWRA pipelines is 80 years, and 20 percent of the water mains are more than 100 years old. Approximately 75 percent of the system's 265 miles of pipeline are unlined. Hydraulic modeling indicates that 73 percent of the system's pipelines have C-values below 100, with 38 percent falling below 70.

Direct field experiences, observations, and repair records also confirm that much of the pipeline network is in substandard condition. Of particular concern is the apparent inoperability of many old mainline valves. Mainline valves are essential for the proper control and shut-off of flow, especially during emergency repair situations. Presently, numerous valves along MWRA pipelines may not be fully operational. The Waterworks Operations Department is currently conducting an aggressive valve exercising program to verify which valves can be operated and which require replacement.

Pipeline rehabilitation or renewal can involve three basic approaches. If the pipeline is structurally sound, then the preferred, lowest-cost method of rehabilitation is **cleaning and lining**. This approach entails thorough cleaning of the pipe to remove all internal deposits and installation of a cement-mortar lining. Usually, all valves and appurtenances are replaced during this process.

Another rehabilitation method which reuses the existing pipe is called **sliplining**. This method involves the insertion of a new smaller diameter pipe within the existing main. Sliplining has limited application in instances where the resultant reduction in pipe capacity would not affect system performance.

The third approach to pipeline rehabilitation is conventional **pipe replacement**. This is the most costly form of rehabilitation, but is necessary when existing pipe conditions are so poor that removal of the old pipe and replacement with new pipe is the only worthwhile option.

For planning purposes when structural information is limited, pipeline cost estimates are based on the assumption that the mix of rehabilitation methods for a given pipe length will be one-third replacement and two-thirds cleaning and lining. Subsequently, as projects approach the design phase, a more accurate assessment of rehabilitation requirements is performed and the budget is updated accordingly.

Given the current condition of the distribution piping network, the MWRA has identified a long-range need to rehabilitate nearly 200 miles of pipeline. The Twenty Year Waterworks Master Plan proposes to address this need on a prioritized basis. Thus, the MWRA aims ultimately to rehabilitate approximately five to six miles of existing pipeline each year through the CIP. However, it will probably take at least several years for the Waterworks Division to reach and maintain that level of productivity. The 29 pipeline rehabilitation projects outlined in this CIP represent the first stage of this long-term program to renew the system's pipeline network.

2302. Valve Replacement

Purpose

To retrofit approximately 500 existing blow-offs and replace several hundred main line valves within the pipeline distribution system. Blow-off retrofits will eliminate cross-connections into sewers or drainage piping. Main line valve replacements will improve operations response to emergency situations, such as pipe breaks. Faster response will reduce negative impacts on customers. Combining the two valve replacement efforts will reduce repeat construction at each site and will reduce traffic impacts, repaving needs and other site specific impacts.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Design	In-house	Sep 89	Jun 06
Equipment Purchase	\$4,486	Jul 96	Jun 06
Construction	\$7,136	Nov 95	May 04
Line Stops/Main Line Valves	\$458	Oct 95	Jun 96
Technical Assistance	\$2	Oct 95	Jun 06
TOTAL:	\$12,082		

Project History and Background

The MWRA owns and operates 265 miles of distribution pipeline which contain approximately 500 inoperable and inadequate blow-off and several hundred main line valves requiring repair or replacement. This project is in part a response to the Massachusetts DEP mandate that no cross-connections are allowed in a distribution system. Currently, blow-off valves are cross-connected into sewers or drainage piping. To ensure that there is no chance of contamination, DEP requires that the blow-off valves be replaced to provide air gaps which ensure that non-potable water cannot reach the level of the blow-off outlet.

Failure of a blow-off valve also results in leakage and loss of water, which occurs in a small percentage of the current valves. Both the blow-off retrofits and main line valve replacements will permit maintenance and pipeline repairs to be performed more efficiently.

Scope

Phase	Scope
Design/Phase 1	Design approach is to prioritize valve replacement depending on the level of urgency or risk associated with each valve, and to schedule work on those valves that will not otherwise be replaced during upcoming pipeline rehabilitation projects.
Construction - Phase 1	Construction of 27 blow-off valve retrofits.
Construction - Phase 2	Construction of approximately 10 blow-off valve retrofits and 10 main line valve replacements.
Construction - Phase 3 - 5	Construction of approximately 30 blow-off valve retrofits and 30 main line valve replacements.
Equipment Purchase 2 - 11	Purchase of approximately 20 main line valves per phase for ten phases for replacement work to be done by in-house staff.
Line Stops/Main Line Valves FY96	Purchase of 20 main line valves and line stops for replacement by in-house crews
Technical Assistance	Technical assistance in the design and construction of valves.

Changes in Scope Since FY96-98 CIP

Phase	Change
Construction 2	Reduced the number of blow-off valve retrofits from 30 to 10 and included the addition of 10 main line valve replacements.
Construction 3-5	Reduced the number of blow-off valve retrofits from 30 to 10 per phase and included the addition of 10 main line valve replacements per phase.

Line Stops/Mainline Valves FY96	New phase for replacement of mainline valves and line stops in fiscal year 1996.
Equipment Purchase 2-11	Reduced the number of blow-off valve retrofits from 20 to 10 per phase and included the addition of 20 main line valve replacements per phase.

CEB Impact None.

2303. Cathodic Protection of Distribution Mains

Purpose To evaluate the condition of approximately 60 miles of steel pipelines and determine the feasibility of upgrading or installing cathodic protection systems to protect pipelines from corrosion.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$214	Apr 95	Jun 00
TOTAL:	\$214		

**Project
History and
Background**

Approximately 60 miles of MWRA waterworks pipelines ranging from 24 inches to 60 inches in diameter are made of steel and are particularly subject to corrosion from acidic soils, fluctuating groundwater levels (especially where the groundwater is saline), and stray electrical currents. These steel pipelines are located within 26 of the Authority's 46 water communities.

Cathodic protection reduces deterioration of steel pipelines, thereby increasing pipeline life and deferring the need for complete replacement. Without proper cathodic protection, pipeline leaks and failures increase, causing costly damage to abutters' property and possible loss of service to customers.

Some sections of the existing steel pipes were originally equipped with cathodic protection systems intended to reduce the effects of corrosion. Other steel pipelines had cathodic protection systems installed sometime after the original pipe installation. Still other sections of steel pipeline never received cathodic protection. Proper maintenance requires anode replacement every 15 years. Unfortunately, even existing cathodic protection systems were not maintained, and these systems are now no longer functioning.

Scope

Phase	Scope
Planning Ph. 1	Evaluate the condition of the steel pipelines.
Planning Ph. 2	Determine the amount of restoration and installation of cathodic protection required.

**Changes in
Scope
since FY96-98
CIP**

None.

CEB Impact

None.

2305. Boston Low Service Pipe and Valve Rehabilitation

Purpose To improve the condition and operability of the pipelines comprising the Boston Low Service System. These unlined, cast iron pipelines are more than 120 years old. The mains have numerous non-functional valves, and have experienced frequent breaks. Improvements will include some pipe replacement, cleaning and lining, and selective abandonment of unneeded segments.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$297	Sep 84	Feb 91
Design/CS/RI	\$3,044	Jul 92	Apr 07
Phase I Equipment Prepurchase	\$892	Feb 95	Dec 95
Construction	\$19,823	Apr 98	Apr 07
TOTAL:	\$24,056		

**Project
History and
Background**

The Boston Low Service network serves downtown Boston and surrounding areas. Water delivered by this network accounts for 15% of MWRA use. The Boston Low Service System contains more than 20 miles of old 36-to 48-inch diameter cast iron pipe. The pipes were laid in the 1800s before the advent of heavy vehicles. The pipes are subject to a disproportionate share of major breaks due both to their age and surface loadings in excess of design strength. Pipe breaks result in service disruptions, loss of water, property damage, and even collapse of street pavement. During a pipe repair, the broken section is isolated by closing valves on either side of the break for the purpose of shutting off the water and preventing major water loss. More than 40 percent of the isolation valves on these pipelines are not operational; they are not repairable due to their age. Their condition inhibits the ability to shut down the lines quickly during an emergency.

Rehabilitation of the pipeline and replacement of the valves will improve service reliability, reduce the risk of property damage, and improve water conservation by reducing leakage.

Scope

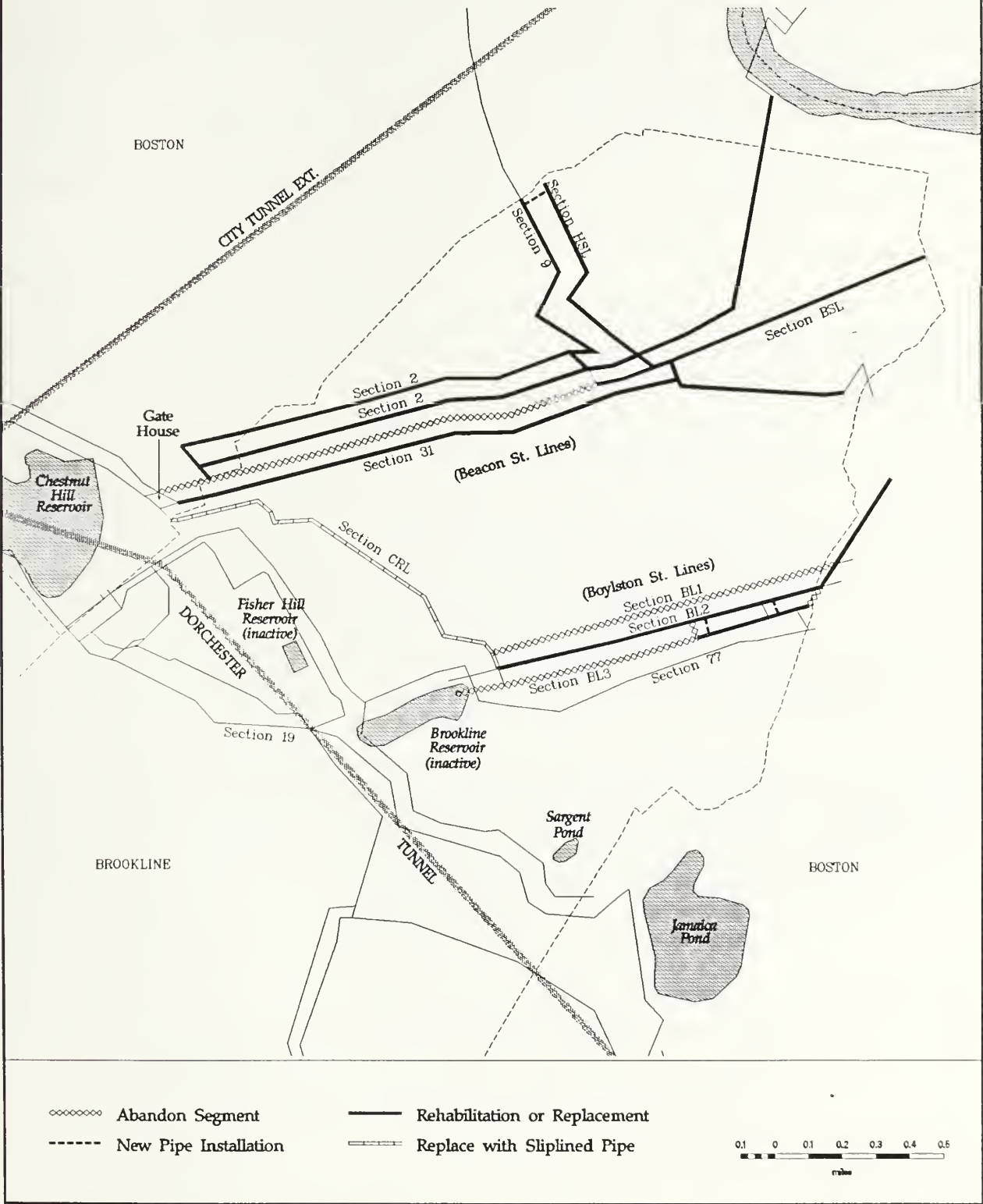
Phase	Scope
Study - Pipe	Determined the structural integrity of the pipe, the condition of the bedding material, and the extent of pipe corrosion. The study revealed that approximately 10.6 miles of pipeline required either cleaning and cement-mortar lining with internal seals installed at pipe joints or other rehabilitation. Three pipelines with a total length of 3.7 miles will be filled with a sand cement slurry and abandoned.
Test Pits	Exploratory excavations completed in Brookline to expose cast-iron pipes at ten sites considered representative of conditions in the overall Boston Low Service System. This was completed in-house.
Phase I - Equipment Prepurchase	Equipment purchases for the replacement of valves and other appurtenances near the Chestnut Hill Reservoir Gate House.
Design/CS - Clinton Rd. & Boylston St.	Design and construction services of the rehabilitation and/or abandonment of Clinton Road and Boylston Street lines.
Construction - Clinton Rd. & Boylston St.	Sliplining of the Clinton Road line and the rehabilitation and/or abandonment of Boylston Street lines.
Design/CS - Beacon St.	Design and construction services of the rehabilitation and/or abandonment of the Beacon Street lines, the Beacon/Longwood line, the Harvard Street line, and sections of the East and West Spot Pond Supply Mains in Brookline.
Construction - Beacon St.	Rehabilitation and/or abandonment of the Beacon Street lines, the Beacon/Longwood line, the Harvard Street line, and sections of the East and West Spot Pond Supply Mains in Brookline.
Resident Inspection	Inspection of all phases of construction.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction - Beacon St.	The MWRA will be coordinating the valve replacements and construction with Brookline's road re-construction program along Beacon Street in the Coolidge Corner area.

CEB Impact None.

BOSTON LOW SERVICE PIPELINE REHABILITATION



2306. Rehabilitation of Weston Aqueduct Supply Mains 1 and 2 (WASM 1 & 2)

Purpose To improve the condition and carrying capacity of this major supply line serving the Boston Low System. WASM (Weston Aqueduct Supply Main) 1 and WASM 2 are 90- and 80-years old respectively. Both are unlined, cast-iron mains with poor internal conditions and many inoperable valves. Rehabilitation will address these factors primarily through cleaning, lining, and valve replacement.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CA/RI	\$6,231	Aug 97	Feb 08
Land Acquisition	\$123	Aug 97	Feb 08
Construction	\$29,374	Jan 00	Feb 08
TOTAL:	\$35,728		

**Project
History and
Background**

WASM 1 is a 90 year old, 48-inch diameter pipeline about 39,000 feet long. WASM 2 is an 80 year old, 60-inch diameter pipeline about 34,500 feet long. WASMs 1 and 2 begin in Weston at the Weston Aqueduct Terminal Chamber (WATC) and run parallel through Newton, mostly along Commonwealth Avenue, ending in Boston near Chestnut Hill. These pipelines supply water to the Boston Low pressure zone. A portion of these pipelines have been included in the WASM 4 contract; about 7,200 feet of each line. Rehabilitation of the these WASM section are necessary to restore their original carrying capacity, replace and add new valves, eliminate tuberculation on the interior walls, and apply cement mortar lining to the interior pipe wall to prevent further internal corrosion. WASMs 1 and 2 are currently functioning below their full carrying capacity; C-Values are 70 and 83, respectively, due to a build up of rust deposits and other matter along the pipeline walls, and undersized mainline valves.

Existing valves will be replaced and additional valves will be incorporated into the pipelines to provide more efficient operations or emergency response. With new valves, the ability to respond to emergencies requiring isolation or re-routing of WASM 2 flow will be greatly enhanced, thereby reducing the damage, cost, and risk associated with a pipeline break.

Scope

Phase	Scope
Design	Exploratory excavation and corrosion analysis will evaluate the structural integrity of the pipe, the condition of the bedding material, and the extent of pipe corrosion. Design, Construction Administration, and Resident Inspection of approximately 32,000 linear feet of 48-inch pipeline and approximately 28,000 linear feet of 60-inch pipeline.
Land	Purchase of any land required to complete the construction project.
Construction - Commonwealth Ave. WASM 2	Rehabilitate approximately 6,000 linear feet of 60-inch pipeline of WASM 2 from Bullough Parkway along Commonwealth Ave. to Grant Ave in Newton. Rehabilitate approximately 1,000 linear feet of 48-inch pipeline of WASM 1 on Centre Street in Newton.
Construction - Commonwealth Ave. WASMs 1 and 2	Rehabilitate approximately 12,500 linear feet each of 60-inch and 48-inch pipeline of WASMs 1 and 2, respectively, from the Mass Pike to Bullough Parkway along Commonwealth Ave. in Newton.
Construction Newton and Brighton	Rehabilitate approximately 8,300 linear feet of 48-inch pipeline of WASM 1 on Centre Street in Newton. Rehabilitate approximately 5,300 linear feet of 60-inch pipeline of WASM 2 from Commonwealth Ave. and Grant Ave across the golf course and back to Commonwealth Ave. in Newton. Rehabilitate approximately 6,000 linear feet of 48-inch pipeline of WASM 1 from commonwealth Ave. and Bullough Parkway to Centre Street in Newton. Rehabilitate approximately 4,000 linear feet of 48-inch pipeline of WASM 1 and 4,700 linear feet of 60-inch pipeline WASM 2 on Commonwealth Ave. in Brighton.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
DesignCA/RI	<p>Transferred all phases of approximately 28,000 linear feet of 60-inch pipeline to this project from the former WASM 2 project.</p> <p>The construction components of WASMs 1 and 2 have been separated into three phases in order to coordinate the MWRA's work with the City of Newton's road re-construction program.</p>
Construction - Commonwealth Ave. WASM 2	Transferred approximately 6,100 feet of the former WASM 2 project and separated construction of WASMs 1 and 2 into three phases.
Construction - WASMs 1 and 2	Transferred approximately 12,500 feet of the former WASM 2 project and separated construction of WASMs 1 and 2 into three phases.
Construction - Newton and Brighton	Transferred approximately 10,000 feet of the former WASM 2 project and separated construction of WASMs 1 and 2 into three phases.
Land	Cost of easements related to revised construction scope.

CEB Impact None.

2307. Nonantum Road Pipe Rehabilitation

Purpose To repair a deteriorated section of the Nonantum Road Pipeline in Brighton that experiences frequent leakage and contributes to settlement of the road bed. This line is part of Weston Aqueduct Supply Main (WASM) 4, and serves Newton, Watertown, Somerville, Medford, Everett and Chelsea. Work will include rehabilitation of the pipeline section that is exposed to harsh and corrosive conditions.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	In-house	Jun 87	Mar 96
Construction	\$1,854	Mar 96	Mar 97
Technical Assistance	\$15	Jan 91	Mar 97
Equipment Purchase	\$157	Jan 91	Dec 92
TOTAL:	\$2,026		

**Project
History and
Background**

The Nonantum Road Pipeline is in Brighton and serves Newton, Watertown, Somerville, Medford, Everett and Chelsea. The pipeline is subject to corrosive soils which have weakened and corroded the steel pipe, resulting in frequent leaks.

Scope

Phase	Scope
Site Survey	Survey of the pipeline site in Brighton.

Preliminary Design	Initial design of the rehabilitation of the 6,200 linear feet of the 60-inch water pipeline.
Final Design	Final design of the pipeline rehabilitation.
CS/RI	Construction services and resident inspection of the pipeline rehabilitation.
Construction	Rehabilitation of the pipeline; approximately 3,500 linear feet will be sliplined with new linear pipe, 120 linear feet will be replaced, and approximately 2,580 linear feet will be cleaned and lined.
Equipment Purchase	Purchase of equipment for 2,600 linear feet of 8 inch diameter pipeline constructed by in-house crews to the MDC skating rink.
Technical Assistance	Technical assistance in completing the pipeline rehabilitation.

**Changes in
Scope Since
FY96-98 CIP**

Phase	Change
Equipment Purchase	New phase for work that had been completed in the past by in-house crews but was erroneously charged to the construction account.

CEB Impact None.

2309. Warren Cottage Line Rehabilitation

Purpose To improve the carrying capacity and internal condition of the Warren Cottage Line which services a portion of Boston via the Southern High Service System. Improvements, which will also strengthen the surface connection between Shafts 7B and 7C of the Dorchester Tunnel, will include cleaning and lining to remove build up of rust deposits.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	In-house	Jan 97	Jul 00
Easements	\$11	July 00	Jun 01
Construction	\$1,474	Aug 00	Jul 01
TOTAL:	\$1,485		

**Project
History and
Background**

The Warren Cottage Line is part of the Southern High Service System in Brookline and Boston. The 131-year old pipe is approximately 5,700 linear feet and extends from the Fisher Hill Reservoir in Brookline to Boston Meter 6. It has been estimated that the line has approximately 50% of its original carrying capacity (C-Value: 68) due to the build up of rust deposits and other matter along the pipeline walls.

Scope

Phase	Scope
Design	Exploratory excavation and corrosion analysis to evaluate the structural integrity of the pipe, the condition of the bedding material, and the extent of pipe corrosion. Design of the pipeline.

Easements	Acquisition of easements required for rehabilitation of the pipeline.
Construction	Rehabilitation of 5,700 linear feet of 30-inch unlined cast iron pipe consists primarily of cleaning and cement mortar lining and replacement of all gate valves, blowoff valves, and other appurtenances.

Changes in Scope Since FY96-98 CIP None.

CEB Impact None.

2310. Southern Service Improvements

Purpose To improve the reliability and capability of key facilities serving the Southern and Southern Extra High systems. These facilities include the Newton Street Pump Station, the Hyde Park Pump Station, and adjoining pipelines which supply Brookline, Milton, Quincy, Canton, and part of Boston. Improvements will be made to the Newton Street Pump Station, existing yard piping in both Newton Street and Hyde Park will be replaced, and new suction and discharge pipelines will be constructed for both pump stations.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$2,067	Apr 82	Mar 02
Construction	\$10,525	May 90	Mar 02
Technical Assistance	\$31	Jul 90	Mar 02
TOTAL:	\$12,623		

**Project
History and
Background**

The Southern High and Southern Extra High Service pipelines, together with the Hyde Park and Newton Street pump stations, supply Brookline, Milton, Quincy, Norwood, much of Boston, and part of Canton. The Hyde Park Station was built in the 1890s. The Newton Street Pump Station was constructed in the 1950s. Pumps at the Newton Street Pump Station and the yard piping at both stations are undersized to meet the current and future water supply needs of the service region. In addition, the pipelines suffer from corrosion, and portions have insufficient capacity and strength for the supply and pressure required to ensure service delivery.

Scope

Phase	Scope
Design HP Ave - Yard Pipe	Design the replacement of yard piping at the Hyde Park Pump Station.
Construction -HP Yard Piping	Replacement of the pump station yard piping.
Design/CS/RI - Hyde Park Ave.	Design the replacement of 7,500 linear feet of 20- to 24-inch cast iron pipe with new 30- to 36-inch pipe.
Construction -Hyde Park Pipeline	Replacement of 7,500 linear feet of 20-24 inch cast iron pipe with new 30-36 inch pipe.
Design/CS/RI - Newton St. Pump Station	Design, construction services, and resident inspection for major rehabilitation of the pump station including new pump units, redundant piping, isolation valves to prevent flooding, emergency generators, replacing building systems, and building and site refurbishment.
Construction - Newton St. Pump Station-Phase 1	Provide immediate upgrades of mechanical/electrical systems, and minor building improvements.
Construction - Newton St. Pump Station-Phase 2	Replace pumping units, electrical and mechanical systems, redundant piping, isolation valves, install an emergency generator, and complete building and site refurbishment.
Design/CS/RI - 94 & 96	Design 5,600 linear feet of 30- to 36-inch suction pipeline to the Newton Street Pump Station and 7,500 linear feet of 30-inch suction pipeline to the Hyde Park Pump Station.
Construction - Section 96	Construction of 5,600 linear feet of 30- to 36-inch suction pipe to the Newton Street Pump Station.
Construction - Section 94	Construction of 7,500 linear feet of 30-inch suction to the Hyde Park Pump Station.
Boston Paving	Final road restoration of 7,500 linear feet along American Legion Highway associated with Section 94 construction.
Technical Assistance	Technical assistance for construction of the Newton Street Pump Station and adjoining pipelines.

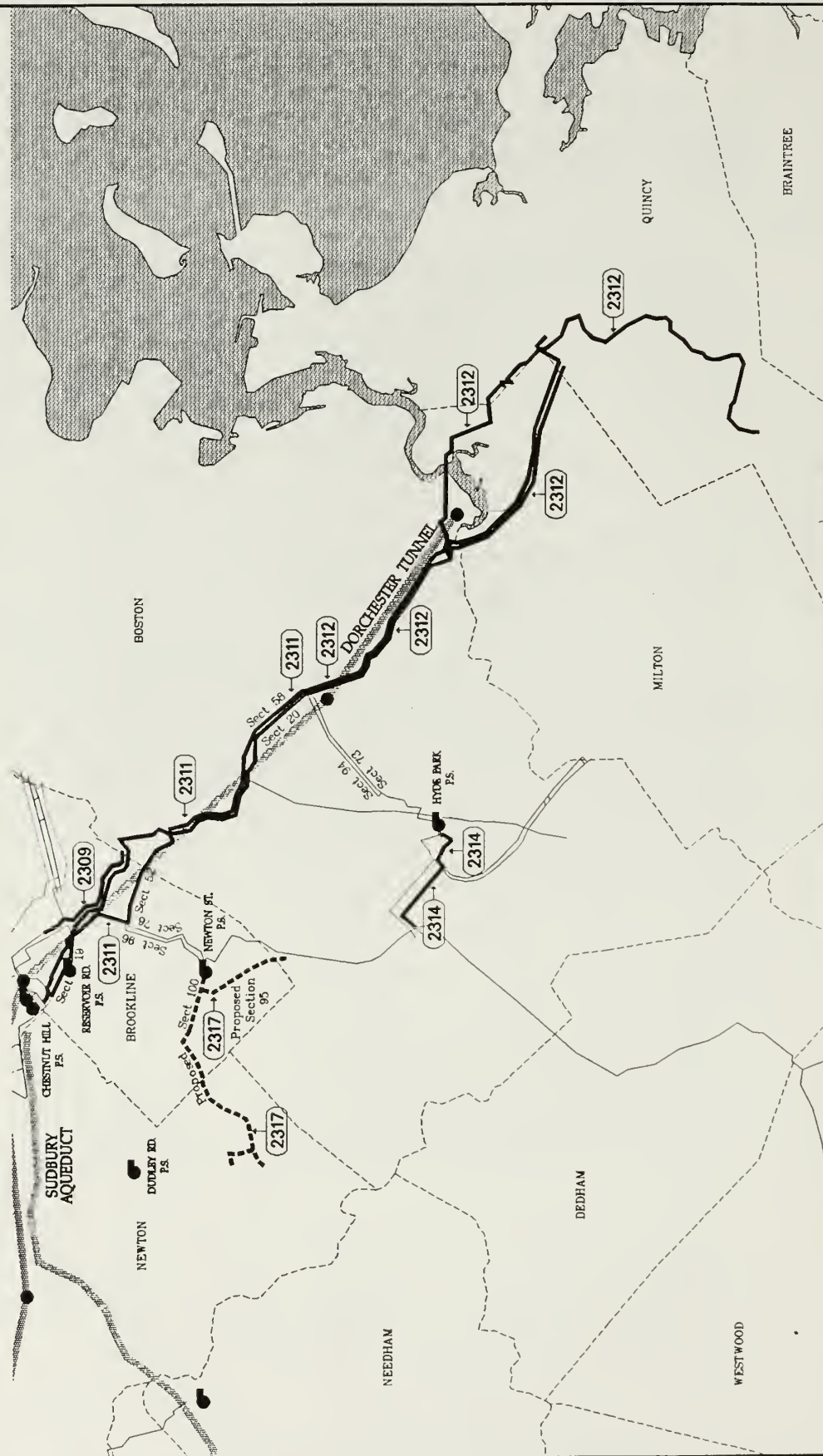
**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction Newton Street Pump Station Phase 2	Addition of isolation valves at the pump station.

CEB Impact

CEB line item	Incremental cost in FY98	Description
Electricity	\$39,400	Change from diesel to electricity.
Diesel	(\$10,000)	Change from diesel to electricity.
Maintenance	\$0	Preventative maintenance.
Vehicle	\$12,000	Crew transportation.
Total	\$41,400	

SOUTHERN SERVICE PIPELINE PROJECTS



2311. Heath Hill Pipe Replacement

Purpose To repair and improve pipelines and valves which are in poor condition in the Southern High and Southern Extra High Service areas. The targeted pipelines in Brookline and Boston have experienced numerous leaks and breaks, and their hydraulic performance is inadequate. Work will include a fast-track pipe replacement phase, and mostly cleaning and lining along the other pipe segments.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$2,717	May 89	Mar 03
Construction	\$11,511	Apr 96	Mar 03
Easements	\$43	Jan 95	Nov 01
Technical Assistance	\$8	May 89	Mar 03
TOTAL:	\$14,279		

**Project
History and
Background**

These sections of pipeline near Heath Hill Road supply water to Brookline, Boston, and the Southern Extra High Service System. The severe corrosion on Sections 19, 20, 52, and 58 has resulted in 23 leaks during the last ten years. This project consists of the rehabilitation and/or replacement of these pipelines. Section 58 is 60 years old, and Sections 19 and 20 are 100 years old. All sections have extensive records of leaks and breaks and warrant rehabilitation or replacement. These 36- and 48-inch diameter cast iron and steel mains run parallel to the Dorchester Tunnel and serve as a suction main to the Hyde Park Pump Station which supplies the Southern Extra High System. The 54-inch steel main section 52 extends from Chestnut Hill Pump Station to Sections 19, 20 & 58 and provides suction to the Newton Street Pump Station.

Scope

Phase	Scope
Design/CS/RI Section 52 Replacement	Design and related construction services for the replacement of 820 linear feet of existing pipe with new 54-inch diameter pipe and the installation of a new butterfly valve.
Construction 52 Replacement	Replacement of a portion of Section 52 and the installation of a new butterfly valve.
Design/CS/RI - Section 52 Rehabilitation	Design and related construction services for the removal and replacement of existing pipe and valve connections along Section 52 and cement mortar lining of approximately 12,500 linear feet of 54-inch steel pipe.
Construction - Section 52 Rehabilitation	Rehabilitation of a portion of Section 52 steel pipe and replacement of valve connections.
Des/CS/RI - Sections 19, 20, & 58	Design and related construction services for the rehabilitation of approximately 11,000 feet of 36-inch diameter and 10,000 feet of 48-inch diameter segments of Sections 19, 20, and 58.
Construction - Sections 19, 20, & 58	Rehabilitation of approximately 11,000 feet of 48-inch diameter and 10,000 feet of 36-inch diameter segments of Sections 19, 20, and 58. Also includes valve, meter, and vault construction at Shaft 7C to incorporate all hazardous material work at Shaft 7C into one contract.
Legal / Easements - Rehabilitation	Easements along the construction route for Section 52 Rehabilitation.
Legal / Easements - New	Easements along the construction route for Section 52 - New.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Design	Additional design for Section 52 - Rehabilitation.

CEB Impact None.

2312. Southern Spine Distribution Mains

Purpose To increase carrying capacity and improve valve operability along the large surface mains which run parallel to the Dorchester Tunnel in providing service to the Southern High and Southern Extra High systems. Currently these spine mains have serious hydraulic deficiencies and many inoperable valves. Hydraulic performance improvements are needed to provide redundancy for the Dorchester Tunnel. Work phases will include rehabilitation of more than 12 miles of large diameter pipeline.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RIs	\$6,269	Nov 98	Nov 09
Easements	\$181	Jul 02	Jun 08
Constructions	\$29,411	Mar 03	Nov 09
TOTAL:	\$35,861		

**Project
History and
Background**

The Southern Spine Distribution Mains comprise the surface piping which parallels the Dorchester Tunnel. The mains begin in the vicinity of Shaft 7B in Brookline and end at the Blue Hills Reservoir in Quincy. The mains serve the Southern High and Extra High System communities of Boston, Brookline, Milton, Quincy, Norwood, and Canton.

Because of the poor conditions of the valves, Waterworks Operations staff frequently have to close several valves in order to shut down the line. This practice often results in closing more of the system than is otherwise necessary. These pipelines are currently functioning at approximately 50% of their original carrying capacity (C-Values: 60-70) due to the build up of rust deposits (tubercules) and other matter along the pipeline walls. In their present condition, these mains could not provide adequate service to users if the Dorchester Tunnel was taken off-line.

Scope

Phase	Scope
Design/CS/RI Sections 21, 22 & 43	Exploratory excavation and corrosion analysis performed during the preliminary design phase will evaluate the structural integrity of the pipe, the conditions of the bedding material, and the extent of pipe corrosion. Design, construction services and resident inspection for the rehabilitation of 30,000 linear feet of 48-inch main, and 24,500 linear feet of 24-inch main.
Easements - Sections 21, 22 & 43	Acquisition of property and/or easements required to complete sections 21, 22 & 43.
Construction - Sections 21, 22 & 43	Rehabilitation of 30,000 linear feet of 48-inch main, and 24,500 linear feet of 24-inch main. Rehabilitation is expected to consist of cleaning and cement mortar lining the interior pipeline wall, as well as replacing all the mainline valves, blowoff valves, and appurtenances.
Design/CS/RI Section 19	Design, construction services and resident inspection for the rehabilitation of 13,400 linear feet of 48-inch main.
Easements - Section 19	Acquisition of property and/or easements required to complete Section 19 work.
Construction - Section 19	Rehabilitation of 13,400 linear feet of 48-inch main. Rehabilitation is expected to consist of cleaning and cement mortar lining of the interior pipeline wall, as well as replacing all the mainline valves, blowoff valves, and appurtenances.
Design/CS/RI Section 20 & 58	Design, construction services and resident inspection for the rehabilitation of 21,000 linear feet of 36-inch main.
Easements - Section 20 & 58	Acquisition of property and/or easements required to complete sections 20 & 58 work.
Construction - Section 20 & 58	Rehabilitation of 21,000 linear feet of 36-inch main. Rehabilitation is expected to consist of cleaning and cement mortar lining the interior pipeline wall, as well as replacing all the mainline valves, blow-off valves, and appurtenances.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction Phase 1	Transferred construction of 5,800 linear feet segment to Heath Hill Section 52 Rehabilitation.
Design Phase 3	Moved six meters from Water Meter Modernization Project to Phase 3 of this project.
CS/RI Phase 3	Moved the construction services and resident inspection for six meters from Water Meter Modernization Project to Phase 3 of this project.
Construction Phase 3	Construction of six meters from Water Meter Modernization Project Phase 3.
Design/CS/RI, Easements & Construction Phase 1	This phase has been rescheduled to begin 3 years later and Phase 1 has been renamed to Section 19.
Design/CS/RI, Easements & Construction Phase 2	This phase has been rescheduled to begin 2 years later and Phase 2 has been renamed to Section 20 & 58.
Design/CS/RI, Easements & Construction Phase 3	Phase 3 has been renamed to Section 21, 22 & 43. Sections 21, 22, & 43 have been rescheduled to begin 3 years earlier due to the poor condition of Section 22, which is the main supply to the City of Quincy.

CEB Impact None.

2313. Blue Hills Covered Storage

Purpose To provide sufficient distribution storage for the Southern High service area. Presently, the distribution system has no active or emergency storage for Quincy and communities south, creating the potential for supply disruption if repairs are needed on a major transmission line. The new covered storage facility at the Blue Hills Reservation will have a storage capacity of 30 million gallons.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Preliminary Design	\$636	Jul 97	Sep 99
Final Design	\$1,909	May 00	Mar 03
Construction	\$18,995	Mar 03	Mar 05
TOTAL:	\$21,540		

**Project
History and
Background**

Blue Hills Reservoir is a currently inactive open distribution reservoir. Based on a recently-completed engineering study, the MWRA's long-term plan is to provide 500 million gallons of enclosed storage at various locations throughout the waterworks system. This quantity represents approximately one day of maximum demand. The study identified the need for a 30-million gallon covered storage facility at this location. The storage facility will work in conjunction with Section 22 to supply water for the Southern High System in the event that the Dorchester Tunnel requires repairs and will supply water to Quincy in the event that the northern portion of Section 22 is shut down due to a break or for repairs.

Open reservoirs within the water distribution system are considered primary water supply sources under the Safe Drinking Water Act and are therefore subject to the Surface Water Treatment Rule.

State regulations require that all open distribution reservoirs be covered to prevent airborne, land, and water-borne contamination.

Scope

Phase	Scope
Preliminary Design	Preliminary design of a 30-million gallon covered storage facility.
Final Design	Final design of the facility.
Construction	Construction of the facility.

**Changes in
Scope
Since FY96-98
CIP**

None.

CEB Impact

None.

2314. Southern Extra High - Sections 41, 42 and 74

Purpose To increase the hydraulic carrying capacity of the mains that carry pumped water to the Bellevue Tanks, serving the Southern Extra High System. Because these 80-year old cast iron mains are severely limited in the pressures and flows they can convey, the Hyde Park Pump Station cannot operate efficiently. Improvements will include pipeline replacement and rehabilitation.

Expenditure Forecast and Schedule	Phase	Total Contract Amount (\$000)	Begin date	End date
	Design/CA/RI	\$467	Mar 97	Feb 02
	Land	\$25	Jul 00	Jun 01
	Construction	\$2,254	Nov 00	Feb 02
	TOTAL:	\$2,746		

Project History and Background Sections 41 and 42 were built in 1914 of unlined, cast-iron 20-inch pipe. These mains connect the Hyde Park Pump Station and Newton Street Pump Station discharge piping to Bellevue Tanks Number #1 and #2. These pipe sections pass through the Hyde Park section of Boston and serve Norwood, Canton, Brookline, Milton, and Boston. The two sections were installed prior to the construction of Bellevue Tank #2. The second tank stands 25 feet higher than Bellevue Tank #1. Section 41 was installed at a lower ground elevation than Section 42 and was not designed for the increased pressure caused by the higher height of Bellevue Tank #2. As a result, the Hyde Park Pump Station is never operated at full capacity unless the Tank #2 water level is extremely low. Since the Southern Extra High Service System has only a small quantity of storage, it is undesirable to have Tank #2 at a low level. Therefore, the pump station operates below capacity despite the fact that pressure in the system is barely sufficient to meet peak demand.

Section 74 was built in 1951 and is structually inadequate along portions of the pipeline route. Due to the higher pressures when Bellevue Tank #2 came on line, the pipe is susceptible to breaks. Approximately 3,900 feet will be replaced and approximately 5,300 feet will be rehabilitated with new valves and appurtenances.

Scope

Phase	Scope
Design/CS/RI	Design, construction services and resident inspection for replacement of Section 41 with a new 3,000 foot section of 24-inch diameter main, and a portion of Section 74 with a new 900 foot section of 24-inch diameter main. Rehabilitation of 5,300 feet of a 20-inch diameter main of Section 42.
Land	Acquisition of land required to complete the project.
Construction	Replacement of Section 41 with a new 3,000 foot section of 24-inch diameter main, and a portion of Section 74 with a new 900 foot section of 24-inch diameter on Section 74. Rehabilitation of 5,300 feet of a 20-inch diameter main of Section 42.

Changes in Scope Since FY96-98 CIP

Phase	Change
Design/CS/RI & Construction	Change rehabilitation of section 42 to replacement. Addition of replacement of 900 feet of 24-inch pipe line of section 74 and rehabilitation of 5,300 feet of 24-inch pipe line

CEB Impact None.

2315. Chestnut Hill Connecting Mains

Purpose To simplify the complex arrangement of old pipes near Chestnut Hill for safety and operability, and to create a connection between Shaft 7 of the City Tunnel and the Southern Distribution surface mains for redundancy along the Dorchester Tunnel. Restructuring of the piping arrangement will be achieved by constructing several new pipelines, rehabilitating some older pipelines, replacing pressure regulating valves, and abandoning pipes and valves which are no longer needed for service.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Study	\$315	Jan 98	Aug 98
Design/CA/RI	\$613	Jan 00	Jan 06
Easements	\$18	Jul 03	Jun 04
Construction	\$2,815	Jul 04	Jan 06
TOTAL:	\$3,761		

**Project History
and
Background**

At Chestnut Hill the City Tunnel divides into two branches: the City Tunnel Extension going north to supply the Northern High System, and the Northern Intermediate High System and the Dorchester Tunnel which go south to supply the Southern High System and the Southern Extra High System.

There are two shafts in this area: Shaft 7 on the City Tunnel, which is located immediately west of the Chestnut Hill Reservoir, and Shaft 7B on the Dorchester Tunnel, located immediately east of the reservoir. At each of these shafts, two newer pipes extend to connect to the older pipelines of the Boston Low and the Northern Low Service Systems and the Southern High Service System to supply these systems with water from the tunnel.

The Southern High System can only be supplied from Shaft 7B. If the Dorchester Tunnel were to be out of service, it would be necessary to activate the Sudbury Reservoir System, transmit water from there via the Sudbury

Aqueduct (currently on standby) to the Chestnut Hill Reservoir (currently on standby) and utilize pumps in the Chestnut Hill Pump Station to pump water from the reservoir to the Southern High System. This water would not be of acceptable quality and would require a boil order.

The older pipes in the area were originally designed to be supplied from the Cochituate and Sudbury Aqueducts, the Chestnut Hill Reservoir, or the Chestnut Hill High Service and Low Service Pump Stations. None of these facilities are presently in normal use. The pipe network is not only old and inordinately complex, but it is not designed to take water from the two tunnel shafts which are the present source of supply.

Scope

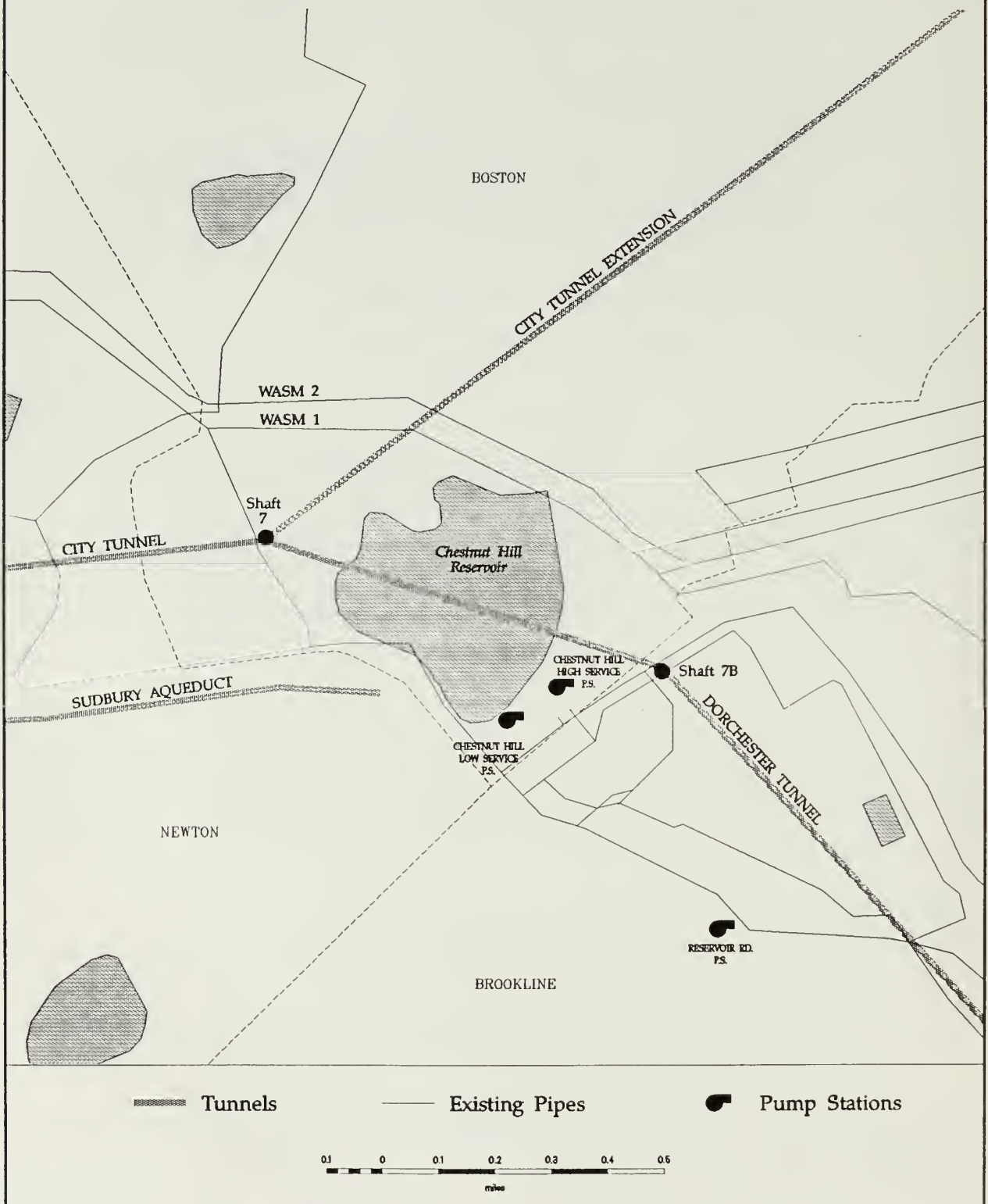
Phase	Scope
Routing Study	Technical and financial analysis of several proposed options will result in the selection of the least cost, technically feasible alternative which meets the objectives of the project.
Design/CA/RI	Design construction administration and resident inspection for the rehabilitation of 1,980 linear feet of 48-inch pipe, 2,400 linear feet of 36-inch pipe, and two Fisher Hill pipelines: one that is 1,150 linear feet of 30-inch pipeline and the other, 2,000 linear feet of 36-inch pipeline, as well as installation of 1,160 linear feet of 36-inch pipeline.
Easements	Acquisition of the land and easements to construct the project.
Construction	Installation of all new pipelines.

Changes in Scope Since FY96-98 CIP

Phase	Change
Design	Moved two new 3,000 feet inserts to the Shaft 7 to WASM project scope 3.
CA/RI	Moved two new 3,000 feet inserts to the Shaft 7 to WASM 3 project scope 3.

CEB Impact None.

PIPE DISTRIBUTION NETWORK AROUND CHESTNUT HILL RESERVOIR AND PUMP STATIONS



2317. Newton Service Improvements

Purpose To provide a new means of supply to Newton's Oak Hill Tank so that the antiquated Dudley Road Pump Station can be abandoned. This new pipeline will also provide redundancy in case of a breakdown at the Commonwealth Avenue Pump Station.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	In-house	Feb 92	Feb 99
Easements	\$68	Jul 96	Jun 97
Construction	\$7,372	Jul 97	May 99
Technical Assistance	\$8	Oct 93	May 99
Tree Removal	\$7	Oct 95	Dec 95
TOTAL:	\$7,455		

**Project
History and
Background**

Newton is the second largest water customer in the MWRA district, with a population of 82,585. Approximately 85 percent of the water delivered to Newton is pumped from the Commonwealth Avenue Pump Station, which connects to the City Tunnel through a single connection at Shaft 6. Although the Commonwealth Avenue Pump Station Rehabilitation Project will provide redundant pumping and power capacity, the single connection to the City Tunnel has proven to be inadequate. In 1990, a valve failed on the pipeline which connects Shaft 6 to the pump station, disrupting water supply to the city for one half of a day.

The Oak Hill section of Newton is presently served by the Dudley Road Pump Station. The station is antiquated, and while the flows and pressures to the service area are adequate under average flow conditions, the station is unable to meet the fire flow service goal for the area. Rather than rehabilitate this station, the MWRA plans to serve the Oak Hill area with a new pipeline connected to the Newton Street Pump Station in Brookline.

Because the suction pipes for the Newton Street Pump Station connect directly to the Dorchester Tunnel, this project will improve reliability and redundancy for both the connection to the City Tunnel and the pump station.

A possible future phase would involve installation of 5,700 linear feet of new 24-inch diameter pipeline connecting from Section 75 to Section 24 at Mamet Road in Newton. The new connection, together with rehabilitation improvements described in the New Connecting Mains-Shaft 7 to WASM 3 Project (#2329), would unify the Intermediate High service zones in Arlington and Newton. Hydraulic performance would be improved and reliability would be enhanced. Discussions are planned to incorporate the Newton Covered Reservoir into this future scenario. No funds are budgeted for this future phase.

Scope

Phase	Scope
Design 1	Design of a new pipeline connected to the Newton Street Pump Station in Brookline to serve the Oak Hill area in Newton.
Easement 1	Acquisition of property required to complete the project.
Construction 1	Installation of 11,278 linear feet of new 24-inch pipeline (Section 100) west from Brookline to the Oak Hill service area in Newton. In addition, 7,350 linear feet of new 30-inch diameter pipeline (Section 95) will be installed, which will parallel Section 78. Also meter # 157 will be rehabilitated. Section 95 has been re-routed to avoid poor soil conditions, and combined with the Oak Hill project under a single construction contract.
Technical Assistance	Technical assistance in the design and construction of the pipeline.
Tree Replacement	Removal of a tree which is in conflict with the proposed suction main.

Changes in Scope Since FY96-98 CIP

None.

CEB Impact

None.

2318. Commonwealth Avenue Pump Station Modernization

Purpose To modernize and improve this 45-year old station which serves a major portion of Newton. The station presently is undersized, has obsolete pumps and motors, and is susceptible to power failures. Improvements will include building upgrades, a new diesel generator, larger pumps and motors, and installation of telemetry.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$1,740	Feb 88	May 99
Land/Appraisal/DEP Fees	\$25	Jul 95	Sep 98
Construction	\$5,576	May 90	May 99
Technical Assistance	\$2	Feb 88	May 99
PCB Abatement	\$50	Apr 96	Jun 97
TOTAL:	\$7,393		

**Project
History and
Background**

The Commonwealth Avenue Pump Station is a 45-year old facility serving Newton. The station's three electric pumps and motors are undersized and nearing the end of their useful lives. The facility is also susceptible to power failure which can result in interruptions in service. Modernization of the pump station will provide the City of Newton with reliable water service delivery.

The major elements of this project include improvements within the existing station and construction of an adjacent building to increase pumping capacity and reliability.

Scope

Phase	Scope
Preliminary Design	Design of the pump station improvements and of the construction of an adjacent building which will include a new diesel generator and two new ten mgd pumps and electric motors to increase pumping capacity.
Design/CS/RI	Final design of the improvements to the pump station.
Appraisal	Appraisal of the land necessary for acquisition to complete the project.
Land	Acquisition of land required to complete the project.
DEP Fees	Fees to the Department of Environmental Protection.
PCB Abatement	PCB remediation prior to construction.
Construction Phase 1	Immediate system upgrades to the pump station.
Construction Phase 2	Rehabilitation, including the installation of two pumps and electric motors, as well as new piping and controls. Modernization will also consist of the addition of monitoring equipment, ventilation, and a security system. The new building adjacent to the existing pump station will include a new diesel generator and two new ten mgd pumps and electric motors.

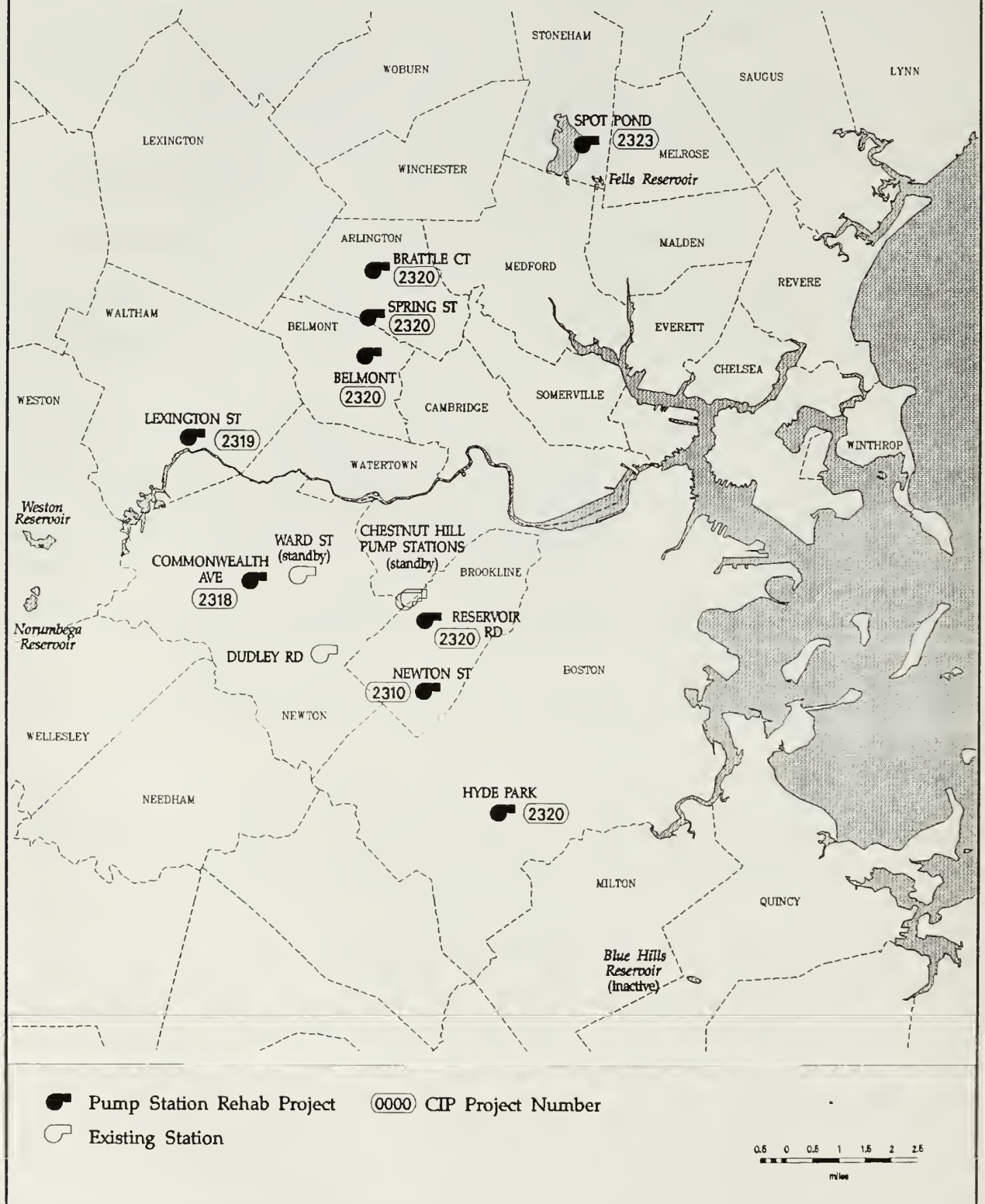
Changes in Scope Since FY96-98 CIP

Phase	Change
PCB Abatement	New phase for PCB remediation.

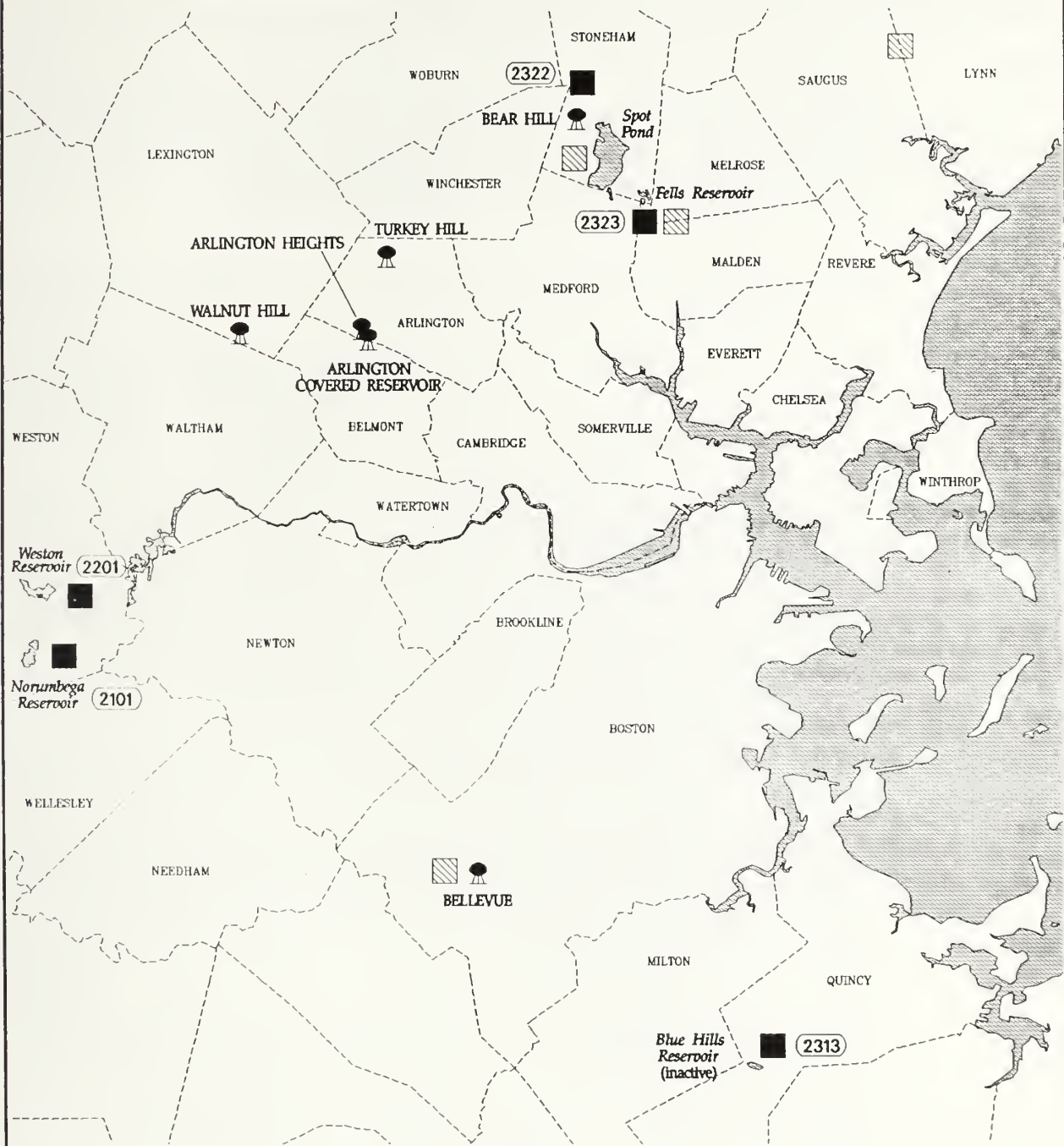
CEB Impact

CEB line item	Incremental Cost in FY98	Description
Maintenance	\$100,000	Preventive maintenance
Vehicle	\$20,000	Crew transportation
TOTAL:	\$120,000	

PUMPING STATION PROJECTS AND LOCATIONS

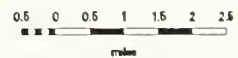


COVERED DISTRIBUTION STORAGE PROJECTS



- Covered Storage Project
 - Potential Future Storage*
 - Existing Storage
- (0000) CIP Project Number

* As recommended in the 1993
Distribution Storage System Study



2319. Lexington Street Pump Station Rehabilitation

Purpose To modernize and improve this 48-year old pump station in Waltham which serves the Northern Extra High System. The station's pumping capacity is inadequate to meet water demands which creates inefficiencies and places stress on other facilities. Improvements will include larger capacity pumping units, backup power generation, and various electrical upgrades.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$503	Feb 88	Oct 97
Land	\$6	Jul 94	Sep 95
Construction	\$2,661	May 90	Oct 97
TOTAL:	\$3,170		

**Project
History and
Background**

The Lexington Street Pump Station provides water to the Stearns Hill section of Waltham. The station has a capacity of 2.7 million gallons per day. The average demand of the service area is about four mgd, with peak demand of 6.5 mgd. Future demand is projected to be five mgd on average and eight mgd at peak periods by the year 2020.

The present 1.3 mgd average day deficiency is met by a connection to the Northern Extra High Service System. Water must travel from Waltham to a pump station in Arlington in order to be pumped to an elevated tank in Lexington, from which it then flows by gravity to a connection in Waltham. It will be more efficient to simply pump the water at Lexington Street in Waltham.

To meet current and projected demand, the pumping units at Lexington Street will be replaced with two new five mgd pumps, and one new 8.5 mgd pump. Related electrical gear and appurtenances will be installed.

To provide facilities for automatic start-up in case of power failure, a generator will be installed. Construction will also include 1,750 linear feet of piping to provide redundant suction and discharge mains for the new pumping units, and isolation valves to protect the station from flooding.

Scope

Phase	Scope
Design/CS/RI	Design of the rehabilitation of the pump station.
Land	Acquisition of the land required to complete the project.
Construction Phase 1	Replace substandard and defective wiring, electrical equipment, and underground storage tanks to provide safety improvements.
Construction MDPW	Install 1,250 feet of a suction main as part of a Massachusetts Department of Public Works urban system project.
Construction Phase 2	Replace the pumping units with two new five mgd pumps, and one 8.5 mgd pump, electrical and mechanical systems; install an emergency generator; complete building and site refurbishing; install 500 linear feet of suction main.

**Changes in
Scope
Since FY96-98
CIP**

None.

CEB Impact

CEB line item	Incremental cost in FY98	Description
Electricity	(\$7,200)	Movement of Meter 82 from Northern Extra High Service Area to Lexington .
Maintenance	\$20,000	Preventive maintenance.
Total	\$12,800	

2320. Rehabilitation of Other Pump Stations

Purpose To rehabilitate five active pump stations (Brattle Court, Reservoir Road, Hyde Park, Belmont, and Spring Street). Each of these five stations is more than 40 years old, and is overdue for renewal for safety, reliability, and efficiency reasons.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Preliminary Design	\$401	Aug 94	Mar 96
Design/CS/RI	\$1,328	May 97	Sep 03
Construction	\$6,917	Sep 01	Sep 03
TOTAL:	\$8,646		

**Project
History and
Background**

The MWRA Waterworks distribution system includes ten active pump stations. Design of extensive rehabilitation of the Spot Pond, Newton Street, Lexington Street, and Commonwealth Avenue pump stations is nearing completion. The Dudley Road Pump Station will not be rehabilitated, since the station will be abandoned.

The Brattle Court, Reservoir Road, Hyde Park, Belmont, and Spring Street stations are between 40 and 80 years old and are overdue for major rehabilitations. The Brattle Court Pump Station serves the towns of Arlington, Lexington, Waltham, and Winchester. The Reservoir Road Pump Station serves the town of Brookline. The Hyde Park Pump Station serves Boston, Milton, Norwood, and Canton. The Belmont Pump Station serves Belmont, Arlington, and Watertown. The Spring Street Pump Station serves Lexington, Bedford, part of Waltham, Belmont, Arlington, and Winchester.

Some equipment at each pump station is inoperable, and system demand patterns have shifted during the life of the stations, requiring adjustments to pumping capacity. In addition, station improvements have not kept pace with changes in the current building and safety codes.

Scope

Phase	Scope
Conceptual Design	Planning and conceptual design to inspect and evaluate the HVAC, buildings, pipes, valves, and other systems at the pump stations; determine what work needs to be done, and prepare a conceptual design report. The cost of construction will be estimated upon completion of the conceptual design phase.
Design/CS/RI	Design, Construction Services, and Resident Inspection for the major rehabilitation of the Belmont, Brattle Court, Spring Street, Hyde Park, and Reservoir Road pumping stations. Rehabilitation will include installing new pump units, correcting structural and emergency deficiencies, building system replacement, and building and site refurbishment.
Construction	Construction associated with the rehabilitation of the Belmont, Brattle Court, Spring Street, Hyde Park, and Reservoir Road pumping stations.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Design/CS/RI	Addition of Design, Construction Services, and Resident Inspection for the rehabilitation of five pumping stations.
Construction	Addition of the Construction phase for the rehabilitation of five pumping stations.

CEB Impact None.

2321. Bear Hill Improvements - Section 29 Rehabilitation

Purpose To improve the condition of this 96-year old pipeline, since its hydraulic capacity has diminished due to build-up of rust and sediment. This pipeline, which serves the Northern Intermediate High System, will be rehabilitated through cleaning and lining.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	In-house	Jun 03	Jan 07
Construction	\$1,354	Mar 06	Jan 07
Easements	\$13	Jul 05	Jun 06
TOTAL:	\$1,367		

**Project
History and
Background**

Section 29 is entirely within Stoneham and serves the Northern Intermediate High Service area. This main is 96 years old and measures 6,300 feet in length and 24 inches in diameter. Section 29 and Section 89 are the only two supply mains to this service area.

Due to its age and the fact that Section 29 is unlined, sediment build-up has reduced the pipeline carrying capacity to approximately 45 percent of the original design capacity (C-value: 58). In the event of a shut down in Section 89, Section 29 would not be able to meet the minimum hydraulic needs of the area. The sediment build-up may also require additional chlorination to maintain water and to contribute to solving taste and odor problems.

Scope

Phase	Scope
Design/CS/RI	Design, Construction Services and Resident Inspection of the rehabilitation of Section 29. Exploratory excavation and corrosion analysis will be performed to evaluate the structural integrity of the pipe, the condition of the bedding material, and the extent of pipe corrosion.
Construction	Rehabilitation of 6,300 linear feet of 24-inch pipe on Section 29. Rehabilitation consists primarily of cleaning and cement mortar lining of the interior pipeline walls, as well as replacement of all mainline valves, blow-off valves, and appurtenances.
Easements	Negotiate easements along the pipeline construction section.

Changes in Scope Since FY96-98 CIP None.

CEB Impact None.

2322. Bear Hill Covered Storage

Purpose To provide an additional storage facility for the Northern Intermediate High System for adequate water pressures and to allow necessary maintenance for preservation of water quality in the existing Bear Hill tank. Construction of a new six million gallon covered storage facility near the existing tank will double the available storage for the Northern Intermediate High System.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Preliminary Design/EIR	\$536	Jan 04	Dec 05
Final Design/CA/RI	\$536	Jan 06	Dec 11
Construction	\$4,284	Jan 09	Dec 11
TOTAL:	\$5,356		

**Project
History and
Background**

Presently, the MWRA pumps water from the Spot Pond Pump Station to the Bear Hill Tank in Stoneham which serves the Northern Intermediate High Service communities of Stoneham, Wakefield, and Woburn.

The existing Bear Hill covered storage facility has a capacity of six million gallons and does not provide sufficient emergency storage for the service area. The MWRA cannot deactivate the tank for necessary cleaning and maintenance without disrupting service.

Scope

Phase	Scope
Preliminary Design/EIR	Prepare an environmental impact report and preliminary design for the six million gallon covered storage facility.
Final Design/CA/RI	Final design, construction administration, and resident inspection for the construction of the facility.
Construction	Construction of the facility.

**Changes in
Scope
Since FY96-98
CIP** None.

CEB Impact None.

2323. Spot Pond Pump Station Rehabilitation

Purpose

To improve and modernize pumping facilities and equipment at the over 90-year old Spot Pond Pump Station, and to provide covered storage at Fells Reservoir to comply with state and federal water quality regulations. These improvements will directly benefit the Northern High and Northern Intermediate High systems, and will improve system-wide emergency response capabilities. Project components include rehabilitation of the pump station, installation of a new suction line, rehabilitation of discharge lines, construction of a sanitary sewer, remediation of a contaminated land site, and construction of a 20-million gallon covered storage facility at Fells Reservoir.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Pump Station Rehabilitation:			
Design/CS/RI	\$2,859	Feb 88	Oct 97
Construction	\$12,556	May 84	Oct 97
Suction Pipeline:			
Study	\$476	Nov 89	Nov 90
Design/CS/RI	\$1,388	Jul 90	Apr 98
Construction	\$10,687	Oct 95	Apr 98
Fells Reservoir:			
Design/CS/RI	\$1,961	May 92	May 99
Construction	\$14,784	Jan 97	May 99
Hazardous Materials Remediation:			
Environmental Assessment & Remediation Plan	\$350	Oct 94	Oct 97

Implementation of Remedial Response	\$1,674	Oct 98	Jul 99
Oil Control Plan	\$171	Aug 92	Dec 92
Drain Line Cleaning	\$268	Nov 92	Jan 93
DEP Review Fees	\$10	Jul 94	Apr 99
Discharge Pipelines:			
Construction-Rehab Discharge	\$1,530	Sep 99	Dec 00
Sewer:			
Construction-Sewer	\$220	May 96	Aug 96
Technical Assistance	\$141	May 84	Jul 99
Paving-Highland Avenue	\$86	Oct 94	Nov 94
DEP Permit Fees	\$3	Jan 93	Dec 94
TOTAL:	\$49,164		

Project History and Background

The pump station at Spot Pond chlorinates and pumps water from the pond to the Northern Intermediate High Service Area (Bear Hill Reservoir) and the Northern High Service Distribution System (Fells Reservoir). The station was built in 1905. Due to the age, condition and critical need of the facility, the rehabilitation of the pump station is a top priority of the Waterworks Division.

A new 14,500 foot, 60- to 72-inch diameter suction pipeline will be installed from the City Tunnel Shaft in Malden to Spot Pond Pump Station. This will provide the station with water at a pressure head greater than from the pond, thereby significantly reducing the need to take water from an uncovered water source, which will meet the requirements of the Safe Drinking Water Act.

The pipeline will improve the reliability of the system by providing increased capacity to transfer water between the low and high service systems during emergencies and facilitate future use of the Fells Reservoir as the main distribution reservoir for the Northern High Service System.

To provide adequate discharge capability, rehabilitation of 9,000 feet of Sections 13 and 64 is also included. These 36-inch diameter mains extend from the pump station to the Fells Reservoir, and deliver water to Melrose and Stoneham. Because the structural integrity of these pipelines has been determined to be sound, rehabilitation rather than replacement is now planned. This will improve carrying capacity, reduce friction and turbulence, and reduce the risk of water quality impairment.

This project also includes a major improvement to the layout of valves between the pump station and Fells Reservoir.

A 1,500 foot sanitary sewer will also be constructed to replace existing septic system that serves the pump station and the adjacent Botume house. Septage from both facilities will be pumped by a small ejector station to an existing MDC sewer on Pond Street in Stoneham.

The Fells Reservoir is located in Stoneham and is one of the several distribution reservoirs maintained by the Waterworks Division for storage of water supply transported from the source reservoirs. The Fells Reservoir provides water to Melrose, Stoneham, Wakefield, and other communities in the northeast portion of the Northern High Service area.

Open reservoirs within the water distribution system are considered primary water supply sources under the Safe Drinking Water Act and are therefore subject to the Surface Water Treatment Rule. State regulations require that all open distribution reservoirs be covered to prevent airborne, land and water-borne contamination. On June 11, 1993, the MWRA, MDC, and the Massachusetts Department of Environmental Protection signed a Consent Order which stipulates that covered storage be provided at Fells Reservoir by December 31, 1998. *The current schedule included in this CIP for completion of construction of the Fells Reservoir covered storage facility is consistent with this order. The May 1999 substantial completion milestone for construction extends beyond December 1998 because of incidental pipe work included in the construction contract for the covered storage facility.*

This project includes installation of 20 million gallon covered storage facility at the Fells Reservoir. Work includes rock excavation and foundation work; installation of intake and overflow lines; *installation of the tank walls, floor, and roofing; and backfill and landscaping.*

The DEP has expressed concern over the potential for cross contamination between the open reservoir basins and the distribution system piping at the bottom of the reservoir. The project scope will be amended to include new

36-inch watermains to replace the existing 50 and 100 year old mains. It is estimated that these mains will cost approximately \$611,000, and will be included in the construction FY98-00 CIP budget for this project.

Geotechnical work, access roads, disinfection facilities, and security fences are also anticipated. An in-house study evaluated several options including covered storage within or along side the existing reservoir. The study looked at several types of storage including concrete tanks, membrane covers, aluminum covers, and steel tanks. The study concluded that a buried, reinforced concrete, two compartment, cast-in-place tank covered with earth and vegetation is the most cost effective and environmentally acceptable option.

During design of the pump station rehabilitation, several environmental problems were discovered including contamination of on-site soil, groundwater, and the adjacent brook. Additional contamination may be encountered during construction. The MWRA is currently working with the Department of Environmental Protection (DEP) to eliminate the sources of contamination at the pump station under emergency order. Once this emergency work is completed, the Authority will begin the cleanup process at the site as required by DEP.

The Spot Pond Pump Station Project also involves the evaluation of the environmental conditions of the site and the nearby Spot Pond Brook area and the preparation and implementation of a remedial cleanup plan. This portion of the project is comprised of three phases and will follow the Massachusetts Contingency Plan as specified by DEP. The first phase (study) consists of an environmental assessment to determine the type and extent of contamination. The second phase (Feasibility Study/Remedial Response Plan) includes a risk assessment to determine the level of risk to the environment and to the public, and the development of a plan of necessary corrective actions. The third phase (Implementation of Remedial Response Plan) consists of performing the restorative work specified in the remedial plan.

Scope

Phase	Scope
Pump	Upgrade of pump for the purpose of pumping to the Bear Hill covered reservoir.
Electrical Upgrade	Electrical system upgraded to provide power for the 300 HP and 500 HP motors added for pumping to Bear Hill Reservoir. Work included site preparation, masonry work, and new conduits and control panels.
Design-Diesel Exhaust	Design for the replacement of the exhaust systems on existing diesel pumps.
Construction-Diesel Exhaust	Replacement of the exhaust systems on existing diesel pumps.
Design/CS/RI-Pump Station	Design, construction services, and resident inspection for major rehabilitation of the pump station including all new pump units, emergency generators, building systems replacement, and building and site refurbishment.
Construction Phase 1	Construction of a new emergency disinfection facility. Immediate rehabilitation of the pump station building which includes space for a new control facility. Refurbish five existing pumps, three diesel engines, and other ancillary equipment so that operations can continue until new equipment is installed.
Construction Phase 2	Installation of eight new pump units, two emergency generators, replacement of all mechanical and electrical systems, and complete building and site refurbishment.
Spot Pond Pump Station Engine 29	New electric drive for Pump # 29 to improve the station's reliability during the renovation period. A 24-inch check valve will be removed from the discharge line and replace a pipe spool piece.
Oil Control Plan	Development and implementation of an oil control plan to eliminate the sources of contamination in the floor drainage.
Drain Line Cleaning	Cleaning of floor drains to eliminate oil contamination drainage into Spot Pond.
Des/CS/RI-Suction Pipe	Design, construction services, and resident inspection of a new 14,500 linear foot, 60- to 72-inch diameter suction pipeline.
Study - Suction Pipe	Study to determine the best method to reduce high water service to the low service gradient of Spot Pond.
Construction-Suction Pipe	Construction of a 14,500 linear foot, 60- to 72-inch diameter suction pipeline to pump water from the gradeline of the City Tunnel rather than that of the low service system to the Northern High Service System.
Hydraulic Transient Analysis	Sizing locating air release and vacuum valves at points along distribution lines 13 and 29 will relieve potentially damaging pressures occurring during winter hammer.

Paving-Highland Ave	Full width overlay of Highland Avenue in Malden from Elm Street to Fells Way.
Design-Rehabilitation Discharge	Design for the rehabilitation of 9,000 linear feet of the 36-inch mains for Sections 13 and 64.
Construction-Rehabilitation Discharge	Rehabilitation of 9,000 linear feet of the 36-inch main for Sections 13 and 64.
Design-Sewer	Design of a 1,500 linear foot sanitary sewer which will be constructed to facilitate abandonment of the existing septic system that serves the pump station and adjacent construction field offices.
Construction-Sewer	Construction of the sanitary sewer in order to conform with DEP requirements.
Design/CS/RI-Fells Reservoir	Design, construction services, and resident inspection for the installation of a 20-million gallon covered storage facility at the reservoir.
Construction-Fells Reservoir	Installation of a 20-million gallon buried, reinforced concrete covered storage facility at the reservoir.
DEP Permit Fees	Department of Environmental Protection permits for construction of the pump station and facilities.
Technical Assistance	Technical assistance in the design and construction of the pump station, suction pipeline, discharge pipeline, and covered storage, for development of the remedial response plan.
Environmental Assessment & Remediation Plan	Determine the type and extent of contamination of the Spot Pond Brook area, develop a risk assessment to determine the level of risk to the environment and to the public, and to develop a remediation plan.
Implementation Remedial Response Plan	Perform the restorative work specified in the remediation plan.
DEP Review Fee	Fee paid to the Department of Environmental Protection for review of corrective measures for Spot Pond to eliminate the sources of contamination at the site.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Replacement of Pump Drive 29	This change consists of testing, permitting, and legal disposal of coal ash removed from the Spot Pond Pumping Station. A 24 inch check valve will be removed from the discharge line, and replaced with a pipe spool piece.
Hydraulic Transient Analysis	Sizing locating air release and vacuum valves at points along distribution Lines 13 and 29 will relieve potentially damaging pressures occurring during water hammer.
Design/CS/RI Suction Line	This design change includes the addition of a pressure relief structure, a separate sewer contract to expedite construction, and an additional valve and stub for Section 49A.
Fells Reservoir	Replacement of 36-inch main at bottom of open reservoir basin to eliminate potential cross contamination.

CEB Impact

CEB Line Item	Incremental Cost in FY98	Incremental Cost in FY99	Description
Electricity		(\$117,050)	Decrease of 45% in power consumption by raising suction pipe 80-feet.
Vehicles	\$13,000		Crew Transportation
Total	\$13,000	(\$117,050)	

2324. Weston Aqueduct Supply Main 4 (WASM 4)

Purpose To improve the condition and carrying capacity of this major supply line presently serving the Northern High and Low Service systems. This 60-year old mostly steel main is unlined, has low C-values, and experiences leaks at an above average rate. Rehabilitation by cleaning and lining and valve replacement will address these factors and also provide flexibility to convert this line from high service to low service as may be needed.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount \$(000)	Begin date	End date
Design/CA/RI	\$5,090	Mar 95	Jan 04
Construction	\$36,004	Apr 95	Jan 04
Appraisal	\$132	Mar 95	Feb 01
Technical Assistance	\$103	Mar 95	Jan 02
TOTAL:	\$41,329		

**Project
History and
Background**

The Weston Aqueduct Supply Main (WASM 4) is a 60-year old, predominantly 60-inch diameter pipeline consisting primarily of unlined steel with some prestressed concrete cylinder and cast iron pipe sections. It extends 47,000 linear feet from Weston through Newton, Watertown and Boston into Cambridge.

WASM 4 was originally part of the Low Service System and conveyed water from the Weston Aqueduct to the Spot Pond supply mains. Upon completion of the Hultman Aqueduct, and its interconnection to the Weston Aqueduct Terminal Chamber in 1941, the western portion of WASM 4 was transferred to the high service system as a temporary means of conveying water from the Hultman to a portion of Newton and Watertown while still maintaining supply to the Spot Pond supply mains at its east end through pressure reducing valves.

In recent years, the middle portion of WASM 4 along Nonantum Road has been shut down due to an excessive leakage rate. The western portion is currently being used to supply about three mgd to portions of Newton and Watertown. The eastern portion is currently being used to transfer water from the City Tunnel Extension via Shaft 8 pressure release valves to the Spot Pond supply mains.

WASM 4 when rehabilitated will be able to operate as it currently does, as a high service main from the Hultman Aqueduct Branch up to the Pressure Release Valve Structure at Nonantum Road, continuing as a low service main to its connections with the East and West Spot Pond Supply Mains. WASM 4 will also have the capability to operate completely as a low service main. This flexibility in operating conditions will allow WASM 4 to best support the system. When in the split high/low mode WASM 4 can support WASM 3 through the planned connecting mains during planned shutdowns or emergencies; this support has significantly reduced the cost of the Connecting Mains - Shaft 7 to WASM 3 project (#2329). However, the present hydraulic characteristics of WASM 4 do not have sufficient capacity to satisfy a peak flow of approximately 40 mgd and during the past 30 years the pipeline has experienced 84 reported breaks; 60 percent of those breaks have occurred during the last ten years.

In order to remove WASM 4 from service to allow it to be rehabilitated, alternative supplies must be provided for Watertown Meter 103 and Newton Meters 104 and 105. Work on meters 104 and 105 is being completed under the Newton Service Improvements (CIP project #2317).

Scope

Phase	Scope
Design/CA/RI	Design, construction administration, and resident inspection for the rehabilitation of Sections 1W, 13W, 14W, 15W and portions of 2W and 5W.
Appraisal/ Easement	Negotiate easements along the construction route.
Construction Commonwealth Ave.	Cleaning and lining of 5,200 linear feet of 48-inch and 10,400 linear feet of 60-inch diameter mains of WASMs 1, 2 and 4 within Commonwealth Avenue in Newton as well as replacement of existing line valves, air/vacuum valves, and blow-off valves.

Construction - Rowe St & Nonantum Rd	Cleaning and cement lining of 20,877 linear feet of 60-inch mains on Sections 13 and 14.
Construction- Section 15 (Brighton)	Sliplining with some limited pipe replacement and cement lining 10,538 linear feet of 60-inch and 1,008 linear feet of 42-inch mains of Section 15. Also, the replacement of Master Meter 100 will be included in this contract.
Construction- WATC & Master Meters	Cleaning and cement lining of 6,233 linear feet of 60-inch mains of Section 1. Also, the construction of a master metering vault is part of this contract.
Construction- Meter 103	Payment to the Massachusetts Highway Department for installation of a new meter, check valve, vault and appurtenances for the rehabilitation of Meter 103.
Construction- MDC Bridge Crossing	Replacement of the two 791 linear foot 30-inch steel mains within the River Street bridge.
Design 2	Design of the rehabilitation of a community pipeline, and two new pressure reducing valve and meter upgrade installations in Newton.
Construction- Newton Water Mains	Rehabilitation consists of cleaning and lining of 8,700 linear feet of 12-inch diameter community pipeline, as well as installation of two new pressure reducing valves and meter upgrades.
Technical Assistance	Provide technical assistance for the Construction 1 and Newton Water Main phases.

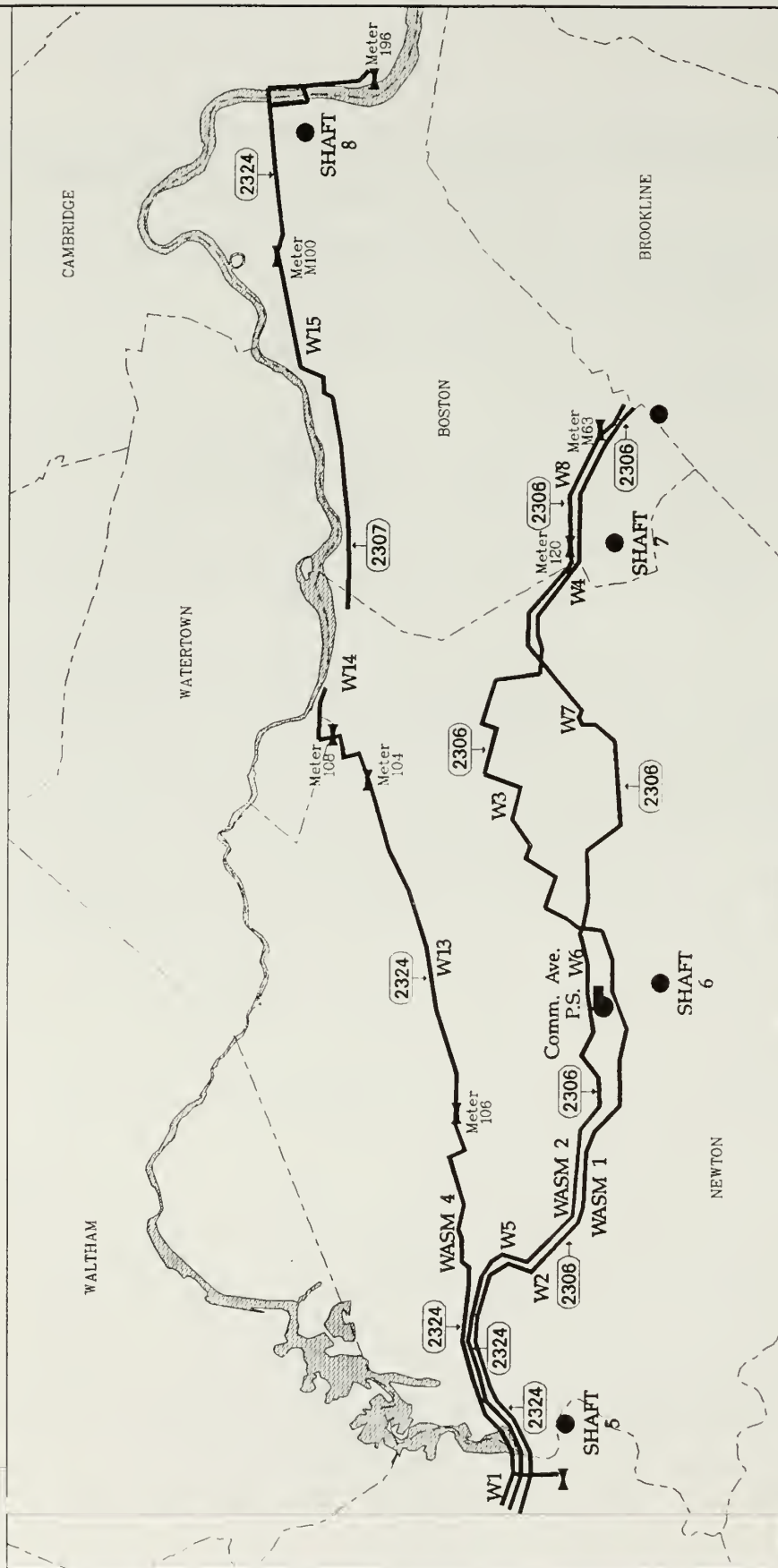
Changes in Scope Since FY96-98 CIP

Phase	Change
Design/CA/RI	<p>Transferred design efforts for both 5,200 foot segments of WASMs 1 and 2 along Commonwealth Avenue to this project.</p> <p>The length of WASMs 1 and 2 along Commonwealth Avenue were moved into this project because it would be more cost effective and efficient to rehabilitate these pipelines while rehabilitating WASM 4 since all three pipes are in the same street. This phase of construction has been advanced to coordinate with the City of Newton's road reconstruction program.</p>

Construction	Separated construction into five phases; and, one phase for payment to Watertown for coordination purposes.
Construction - Commonwealth Avenue	Cleaning and lining of WASMs 1, 2, and 4 along Commonwealth Avenue.
Construction - Rowe St & Nonantum Rd	Cleaning and lining of Sections 13 and 14.
Construction - Section 15 (Brighton)	Sliplining with some pipe replacement and cement lining of Section 15, and the replacement of Master Meter 100.
Construction - WATC & Master Meter	Cleaning and lining of Section 1 and construction of master metering vault.
Construction Meter 103	Payment to Mass. Highway for installation of a new meter, check valve, vault, and appurtenances.
Construction - MDC Bridge Crossing	Replace mains within the River Street bridge.

CEB Impact None.

Rehabilitation of Weston Aqueduct Supply Mains 1, 2, 4



- Legend**
- Pipe Rehab or Replacement
 - CIP Projects
 - (2306) WASM 1 & 2 Rehab
 - (2324) WASM 4 Rehab
 - (2307) Nonantum Road Rehab

2325. Spot Pond Supply Mains-Rehabilitation and Replacement

Purpose To improve the condition, carrying capacity, and valve operability of the two long supply mains which extend north from Chestnut Hill to Spot Pond. These cast-iron mains, which are nearly 100 years old, deliver water to the Northern Low Service System. Improvements will involve a combination of replacement, cleaning and lining, and valve repair, depending on specific site conditions and needs. By improving these supply lines, the need to take water from the City Tunnel to augment the low service system will be reduced.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Study	\$750	Mar 98	Apr 99
Design/CA/RI	\$7,337	Jul 00	Jan 09
Construction	\$34,456	Jan 05	Jan 09
Land	\$165	Jul 04	Jun 05
Equipment Purchase	\$50	Apr 96	Jun 97
TOTAL:	\$42,758		

**Project
History and
Background**

The Spot Pond Supply Mains connect the City Tunnel with Spot Pond to serve the Northern Low Service Area, including portions of Boston, Arlington, Chelsea, Malden, Medford, Somerville, and Everett. The lines are designed to fully supply Cambridge during drought or emergency. The East Spot Pond Main consists of 60,500 linear feet of mostly 48-to 64-inch diameter pipeline which passes through Brookline, Boston, Cambridge, Somerville, Medford, Malden, Melrose, and Stoneham.

The West Spot Pond Main consists of 54,000 linear feet of mostly 48-inch diameter pipeline with short segments of 60- and 102-inch diameter pipeline which passes through Brookline, Boston, Cambridge, Somerville, Medford, and Stoneham. The carrying capacity of the 90-year old mains is reduced to approximately 50% of the original design capacity (C-Value: 67) due to a build up of rust deposits (tubercules) and other matter along the pipeline walls.

Many of the valves on the pipeline are inoperable, and all are beyond their useful lives. Inoperable valves reduce operational flexibility, and the ability to respond to emergencies requiring isolation or re-routing. Restoration of design capacity of these mains is required once Spot Pond Reservoir is taken off line. The planned reconfiguration of the water distribution system assumes that the Spot Pond Supply Mains will no longer feed from the City Tunnel, but rather from the Weston Aqueduct Supply Main 4 (WASM 4), which will be connected to the covered storage facility (Weston Tank) to be constructed near the current location of the Weston Reservoir (Project #2201, MetroWest Tunnel.) The changed configuration will allow the unification of the Northern Low and Boston Low Service Areas into one service area, and will improve pressures to the far reaches of the Northern High Service Area, since the City Tunnel will no longer supply the demands of the Northern Low Service Area.

Scope

Phase	Scope
Preliminary Design	Preliminary Design of alternative construction routes of Section 4, a segment of Section 6, a portion of Section 7, Sections 9, 11, and 12.
Design/CA/RI	Design, Construction Administration, and Resident Inspection for the rehabilitation of Sections 4, 6, portions of Section 7, 9, 11, and 12.
Construction	Construction of the rehabilitation of Sections 4, 6, portions of Section 7, 9, 11, and 12.
Equipment Purchase	Replacement of a valve along the construction route.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Preliminary Design	Combined East Phase 1, East Phase 2, and the West phases. In the FY96-98 CIP, this project was divided into East and West segments. Within these segments, East included Phase 1 and 2, and West included Phase 1. All phases have now been combined into one large phase and more realistic construction schedules have been developed.
Design	Combined East Phase 1, East Phase 2, and the West phases.
CA/RI	Combined East Phase 1, East Phase 2, and the West phases.
Construction	Combined East Phase 1, East Phase 2, and the West phases.
Equipment Purchase	This change consists of replacement of a valve along the construction route.

CEB Impact None.

2326. Northern Low Service Pipeline Replacement

Purpose To repair segments of the Northern Low Service System that experience excessive leakage and require frequent maintenance. One segment is near Medford Square. Rehabilitation will involve pipe replacement and valve and meter improvements.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$432	Aug 88	Apr 03
Construction	\$1,272	Apr 02	Apr 03
Easements	\$6	Jul 01	Jun 02
TOTAL:	\$1,710		

**Project History
and
Background**

The Medford section (Section 16W) of the Northern Low Service Pipeline is in need of repair. The pipeline currently is part of the feed pipeline for Spot Pond in Stoneham. This pipeline was built in the 1930s and suffers from corrosion due to electrolysis and corrosive soils from the tidal flats of the Mystic River. The corrosion levels have led to excessive leaks, resulting in high maintenance costs.

Scope

Phase	Scope
Design/CS/RI-Medford 16W	Design, construction service, and resident inspection for the rehabilitation and/or replacement of Section 16W, two pressure reducing valves, and vaults; replacement of interconnecting piping and two meters at High Street in Medford.

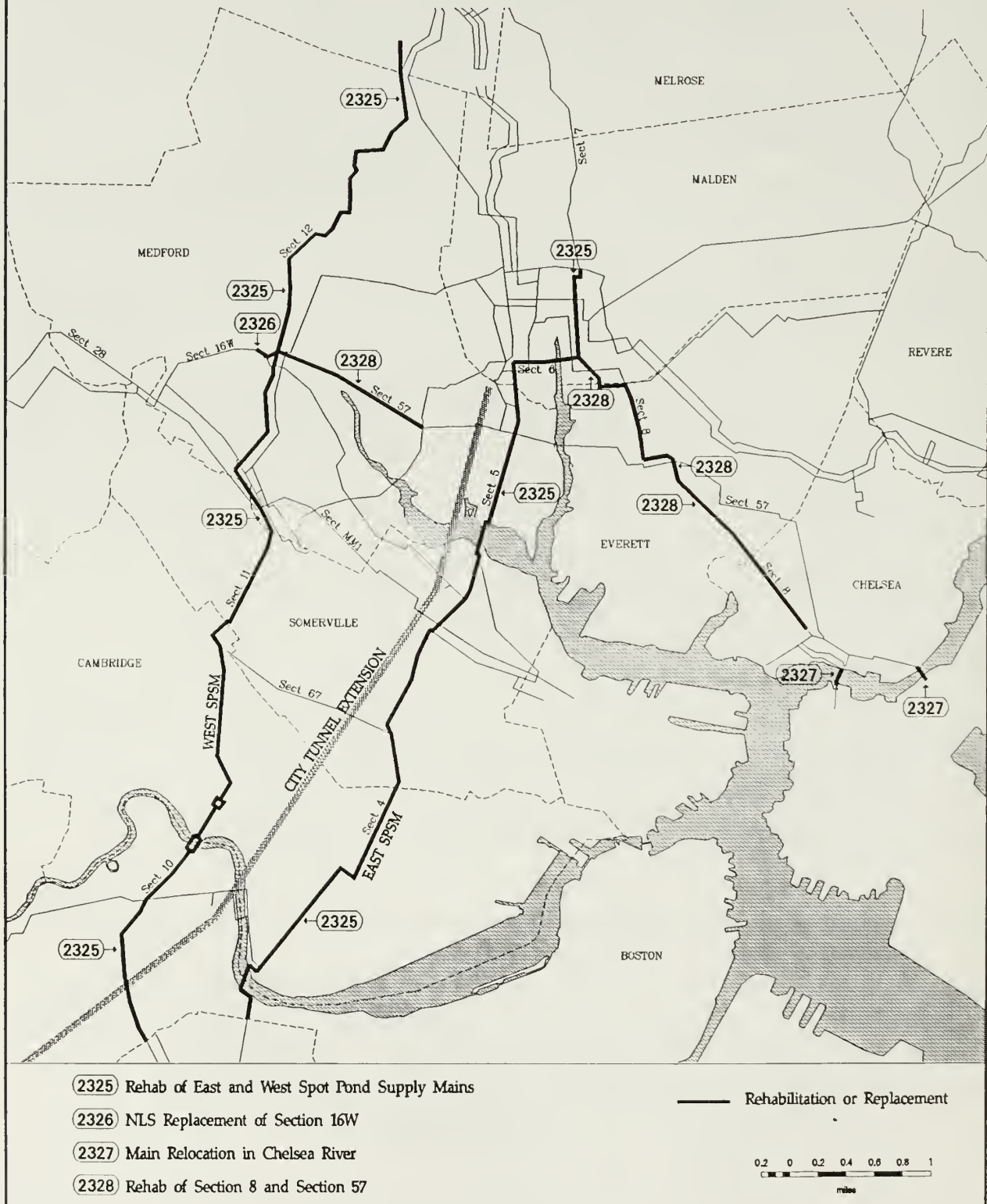
Construction-Medford 16W	Construction consists of: rehabilitation and/or replacement of approximately 1,100 linear feet of 60-inch pipe near Medford Square; rehabilitation of two pressure reducing valves and vaults; replacement of interconnecting piping and two meters at High Street in Medford.
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**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Section 8	Transferred Section 8 into Northern Low Service Rehabilitation Section 8 and 57.

CEB Impact None.

NORTHERN LOW SERVICE PIPELINE PROJECTS



2327. Water Main Relocation in Chelsea River

Purpose To relocate the Section 8 water main which crosses the Chelsea River due to a planned dredging operation by the U.S. Army Corps of Engineers and the Massachusetts Port Authority (Massport). A new pipeline will be installed at a lower depth to maintain service for Logan Airport and East Boston.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Design/CA/RI	\$1,097	Jul 97	Nov 01
Construction	\$0	Mar 01	Nov 01
TOTAL:	\$1,097		

**Project
History and
Background**

Section 8, and two parallel segments of Section 38, of which one is active, traverse the portion of the Boston Harbor known as the Chelsea River and provide nearly all the water for East Boston and Logan Airport. The inactive segment of Section 38, which lies parallel to the active portion of Section 38, can still function as a back-up to contribute a very limited flow to these areas during preventive maintenance.

The U.S. Army Corps of Engineers has notified the MWRA of its intent to deepen and widen the Chelsea River channel to improve ocean access for large fuel tankers. This work is expected to take place within three years and will result in a depth in the river of approximately 38 feet below the mean low water (MLW) level. The top of Section 8 is approximately 39 feet below MLW. This pipeline, which is in the over-dredging zone, will have to be relocated if the project proceeds. The two Section 38 pipelines are approximately 43 feet and 35 feet below MLW.

The older, inactive Section 38 pipeline will be removed and not replaced. The newer, active Section 38 pipeline, whose top is at approximately 43 feet below MLW, will not be disturbed.

Under federal statutes governing navigable waterways, the federal government has the preeminent right to carry out improvements and operations without compensation to local utilities for damages which may occur as a consequence. Therefore, the MWRA is responsible for relocating the affected pipelines prior to the dredging operations of the Corps.

Because there is no storage in this portion of the distribution system, two active pipelines are required at all times to meet the needs of East Boston and Logan Airport. Therefore it is essential that one new pipeline be constructed due to the dredging (Section 8). Without an adequate backup pipeline, any shutdown along one of the two active lines due to maintenance activities or a water main break would severely disrupt flows to Logan Airport.

The recently authorized 1996 Seaport Bond Bill mandates MASSPORT fund the section 8 relocation project.. MWRA will initiate design once terms have been established for reimbursement by MASSPORT.

Scope

Phase	Scope
Planning/ Design/CA/RI	Planning, design, construction administration, and resident inspection for the relocation of Section 8.
Construction	Construction of approximately 950 linear feet of 42-inch diameter pipeline for Section 8, at a level below the mean low water line of 40 feet.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Design	This project was not budgeted in FY96.

CEB Impact None.

2328. Northern Low Service Rehabilitation Sections 8 and 57

Purpose To improve the condition and reliability of two unlined pipe segments serving a portion of the Northern Low System. These pipes, Sections 8 and 57, have reduced carrying capacities due to rust build-ups, and have experienced leaks at above average rates. Improvements will consist primarily of replacement of a portion of Section 8 and, cleaning, lining, and valve repairs along nearly three miles of water main.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design	In-house	Nov 99	May 05
Construction	\$10,447	Jul 03	Mar 07
Easements	\$68	Jul 02	Jun 05
TOTAL:	\$10,515		

**Project
History and
Background**

Section 8 was installed between 1897 and 1913 and serves Malden, Everett, Chelsea, and East Boston. Section 57 was installed in 1938 and serves Malden, Medford, Everett, Chelsea, and East Boston.

The Section 8 pipeline is currently functioning at approximately 45 percent of its original carrying capacity (C-Value: 60) due to the build up of rust deposits and other matter along the pipeline walls. The Section 57 pipeline has experienced five leaks during the last three years. This main is currently functioning at approximately 60 percent of its original carrying capacity (C-Value: 85) due to the build up of rust deposits and other matter along the pipeline walls.

Scope

Phase	Scope
Design: Section 8	Design for the rehabilitation and replacement of Section 8. Test pit excavation and corrosion analysis performed during the preliminary design phase will evaluate the structural integrity of the pipe, the condition of the bedding material, and the extent of pipe corrosion. The results of these analyses will indicate the amount of pipeline which will have to be replaced.
Easements: Section 8	Easements along the pipeline construction route.
Construction: Section 8	Construction will consist of cleaning and cement mortar lining of the pipeline interior, replacement of all defective and inoperable valves, and the strategic addition of new valves for 7,500 linear feet of 48-inch pipe on Section 8 in Malden and Everett. Replacement consists of 9,722 feet of obsolete 42-inch pipeline with new 36-inch ductile iron main and replacement of all necessary valves and blow off connections from Second street in Everett to the Mystic River Bridge in Chelsea.
Design: Section 57	Design for the rehabilitation of Section 57. Test pit excavation and corrosion analysis performed during the preliminary design phase will evaluate the structural integrity of the pipe, the condition of bedding material, and the extent of pipe corrosion. The results of these analyses will indicate the amount of pipeline which will have to be replaced.
Easements: Section 57	Easements along the pipeline construction route.
Construction: Section 57	Rehabilitation will consist of cleaning and cement mortar lining of the pipeline interior, replacement of all defective and inoperable valves, and the strategic addition of new valves for 8,120 linear feet of 48 inch pipe on Section 57 in Medford.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction: Section 8	Transferred Section 8 from Northern Low Service Pipeline Replacement to this project.

CEB Impact None.

2329. New Connecting Mains - Shaft 7 to WASM 3

Purpose

To link Shaft 7 of the City Tunnel to the WASM 3 pipeline with new connecting mains in order to provide increased redundancy and operational flexibility for the Northern High and Northern Extra High Service systems. The strong connections to WASM 3 will allow some sections of the supply line to remain in service even if other sections are shut down for emergencies or routine repairs. This project will involve installation of approximately 43,600 linear feet of new pipeline, rehabilitation/replacement of 31,900 linear feet, and sliplining of 6,000 linear feet of pipeline.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Routing Study	\$408	Aug 94	Nov 96
Design/CA/RI	\$10,332	Dec 97	Jan 07
Construction	\$48,874	Jul 96	Jan 07
Easements	\$246	Jul 01	Jun 04
TOTAL:	\$59,860		

Project History and Background

The Weston Aqueduct Supply Main 3 (WASM 3) is a 56- to 60-inch diameter steel main installed in 1926. Upon completion of the Hultman Aqueduct, and its interconnection to the Weston Aqueduct Terminal Chamber in 1941, WASM 3 was transferred to the high service system. WASM 3 is connected to the Hultman Aqueduct at one end and the City Tunnel at its other end. WASM 3, together with connecting piping, extends from Weston near Shaft 5 to Somerville at Shaft 9. Most of the flow comes from Shaft 5, with peak flows of 57 mgd. A lesser amount enters the main from Shaft 9. There are no connecting mains along most of the length of this 11-mile pipeline, and no other means available to adequately supply the nine communities served by this line.

WASM 3 provides service to the communities northwest of Boston and is the sole source of supply to the Northern Extra High Service Area (Bedford, Lexington, Waltham, Arlington, and Winchester) and the Intermediate High Service Area (Belmont, Arlington, and Watertown). It also supplies a portion of the Northern High Service Area (Waltham, Watertown, Belmont, Arlington, Medford, and Somerville), and is a means of supplying the Spot Pond Reservoir.

A break almost anywhere on this pipeline would result in severe service disruptions in Waltham, Watertown, Arlington, Lexington, Bedford, Winchester, and Belmont. Virtually no water would reach Waltham if a break were to occur at the southern end of the pipeline; water normally supplied through the Shaft 5 connection would be forced through the Shaft 9 connection, increasing flows and reducing hydraulic grade lines in both WASM 3 and the City Tunnel. The lack of redundancy also makes routine cleaning and lining of the 70-year old pipeline impossible. The need for maintenance is indicated by the reduced carrying capacity of the line. The actual carrying capacity of WASM 3 is approximately 65 percent of design capacity (C-Value: 90).

This project has been configured to convey water from an intermediate point or points on the City Tunnel (Shafts 6, 7, or 8) to an intermediate point or points on WASM 3. This will be accomplished by rehabilitating or replacing existing dead-end mains from the City Tunnel or from WASM 3, and connecting these mains by constructing new pipelines, such that transmission loops will be formed between the City Tunnel and WASM 3. A goal of this project is to make it possible to rehabilitate the Intermediate High System; the new pipelines built to loop the high system could temporarily be used as intermediate high mains allowing for rehabilitation/replacement of Sections 25, 59, and 60. The rehabilitation of WASM 4 (CIP project #2324) is also closely related to this project, because WASM 4 will be interconnected to the new connecting mains of the Shaft 7 to WASM 3 project. WASM 4, which can be operated on high or low service, runs from Shaft 5 to Shaft 8, midway between the City Tunnel and WASM 3. Using WASM 4 as a supply means for the new connecting mains has resulted in cost savings by delaying/eliminating the proposed new pipeline south of WASM 4 to a Shaft 7 connection. This project has evolved from the "Shaft 7 to WASM 3" connecting mains to the WASMs 3 and 4 connecting mains.

Scope

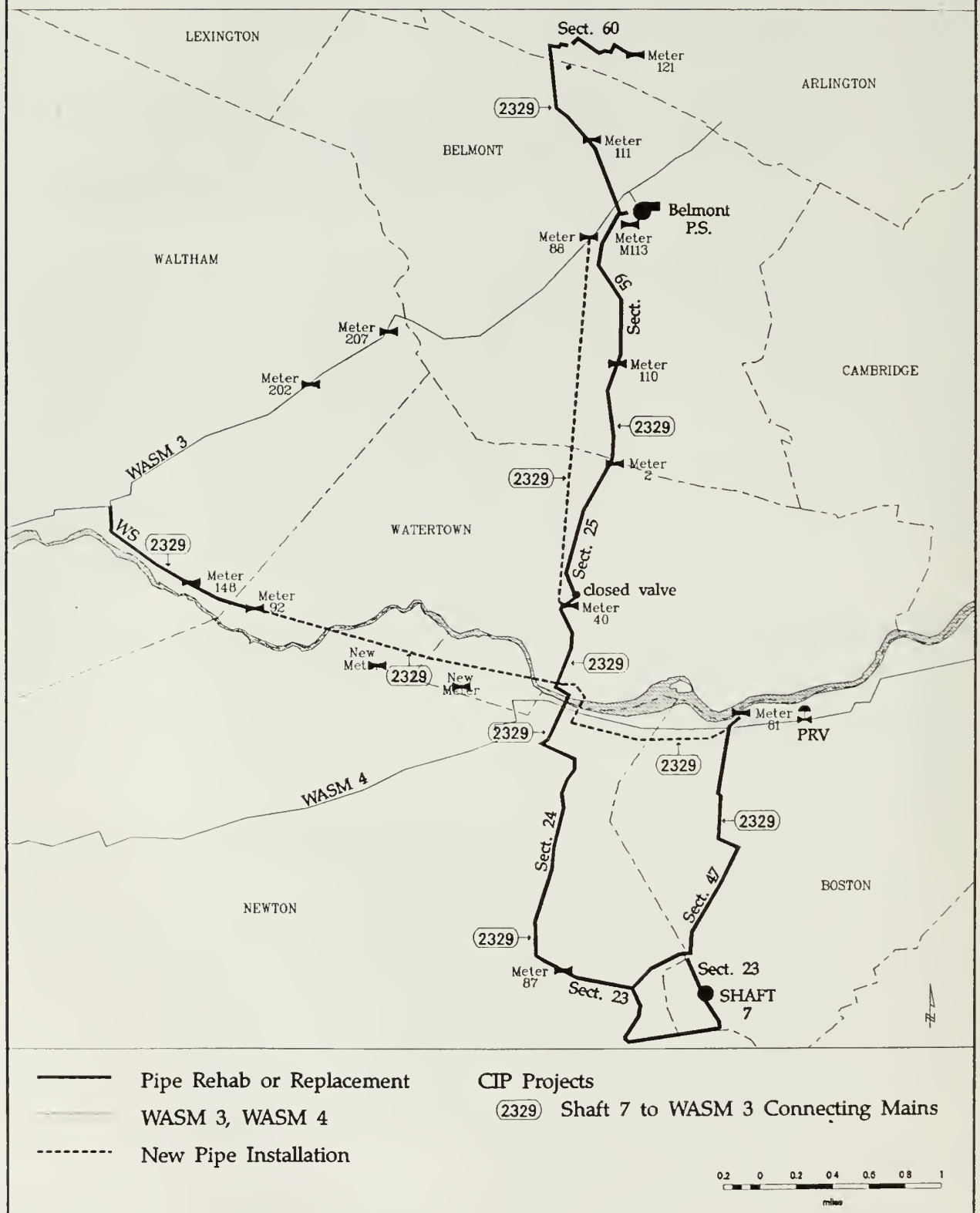
Phase	Scope
Routing Study	Identification of alternatives to determine the optimum approach for providing additional strong connection(s) to WASM 3.
Design/CA/RI	Design, Construction Administration, and Resident Inspection of the north, east, and west segments of the new connecting mains of Shaft 7 to WASM 3.
Construction	<p>Installation of 16,200 linear feet of new 48 inch pipeline (north segment), 11,500 linear feet of new 36 inch pipe (east -west segments), 1,700 linear feet of new 20 inch pipeline, 6,000 linear feet of new 24 inch pipeline, and 6,000 linear feet of 48-inch Cochituate Aqueduct inserts, rehabilitation of 1,500 linear feet of Section 60, 14,500 linear feet of Section 59, 5,770 linear feet of Section WS, 10,130 linear feet of Section 47; replacement of 5,250 linear feet of Section 23 and 13,150 linear feet of Section 24, and 4,900 linear feet of 20 inch pipeline of Section 25.</p> <p>This project now includes all segments originally part of the Intermediate High Supply Line Rehabilitation project, as well as 6,000 linear feet of 48 inch inserts originally part of the Chestnut Connecting Mains.</p>

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Construction 2	Incorporated inserts from Chestnut Hill Connecting Mains Service, and additional pipeline replacement.
Construction Intermediate High	Transfer of Intermediate High Service "Easements" Construction to this Phase to combine work in the same location.
Easements Intermediate High	Transfer of Intermediate High Service "Easements" Construction to this Phase to combine work in the same location.

CEB Impact None.

Connecting Mains from Shaft 7 to WASM 3



2331. Northern High Service - Replacement of Section 26

Purpose

To replace a 98-year old section of small diameter pipe to ensure reliable and adequate service to Saugus and surrounding areas. The existing main is in poor condition, and lacks sufficient capacity to meet the service areas needs. Improvements will be made through installation of a parallel main or direct replacement.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CA/RI	\$878	Aug 99	Sep 04
Land	\$42	Jul 01	Jun 02
Construction	\$4,136	Jun 02	Sep 04
TOTAL:	\$5,056		

Project History and Background

Section 26 extends north from Revere for 18,600 feet to serve four meters in Saugus and Lynn. In conjunction with other existing MWRA pipes in this area this main helps provide redundancy for East Boston, Winthrop, and Deer Island. This 16-inch cast iron pipe is 98 years old and has a C-Value of 57, which has reduced its carrying capacity by more than 50 percent. Since 1990, five repairs have been required along this main. A repair in November 1992 was impeded because the valves were inoperable, necessitating the installation of costly line stops. The very poor condition of the pipe makes rehabilitation impractical, and the small diameter of the pipe would not be capable of meeting the maximum day plus fire flow service goal.

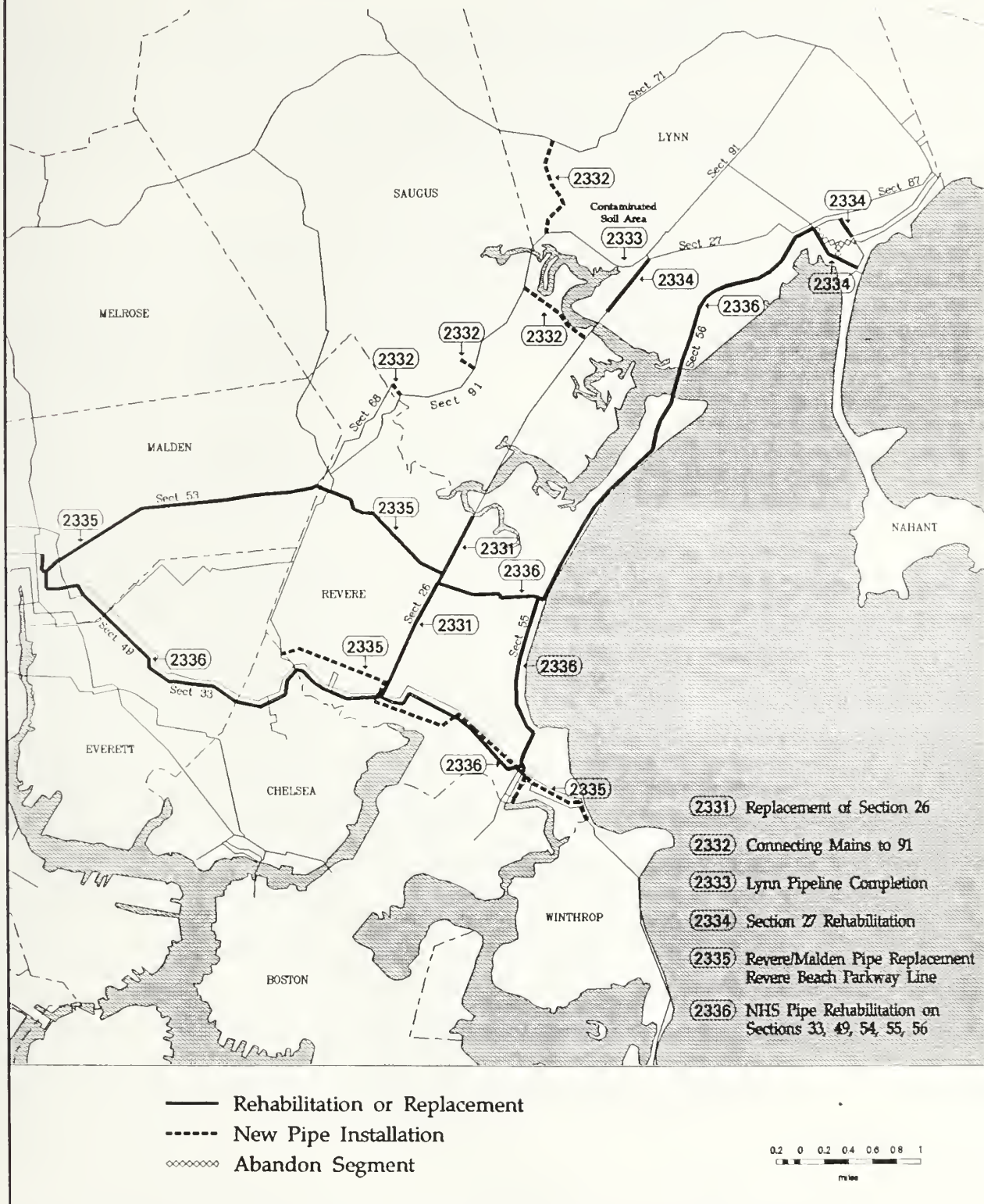
Scope

Phase	Scope
Design	Design of an 11,500 linear feet pipeline replacement. During the preliminary design phase, an analysis of the entire Northern High Service area will be made with the possibility of significantly reducing the scope of work for the Section 26 water main.
Land	Easements along the construction route.
Construction	Replace approximately 11,500 linear feet from the Revere Beach Parkway line to Saugus Meter 125 with new 24-inch pipe.
CA/RI	Construction administration and resident inspection for the project.

Changes in Scope Since FY96-98 CIP None.

CEB Impact None.

NORTHERN HIGH SERVICE PIPELINE PROJECTS 2331 - 2336



2332. Northern High Service - Connecting Mains to Section 91

Purpose To integrate the new Section 91 pipeline with the existing grid network in the northeast portion of the Northern High Service system. Through various new connections, service pressures and reliability to community meters will be improved.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CA/RI	\$1,424	Jun 95	Oct 02
Land	\$38	Jul 99	Jun 00
Construction	\$4,754	Feb 00	Oct 02
TOTAL:	\$6,216		

**Project
History and
Background**

Sections 91 and 92, installed under the Northern High Service Pipe Improvements-Lynn Pipeline project, have been completed except for a small segment of Summer Street. This major new transmission main will greatly improve flows and pressures to the entire northeast portion of the High Service Area. To gain the full benefit of this main, branches need to be constructed from it to tie into existing and proposed community meters as well as to existing MWRA mains. Three connections will serve this purpose.

The first connection is between Section 91 and Section 68 and will pass through Revere and Saugus and serve both towns. While the current pressure and flow rate of the existing Section 68 is considered adequate under average flow conditions, it does not meet the maximum day plus fire flow service goal defined in the Waterworks Master Plan for Saugus Meter 134.

The second proposed pipeline connects Section 26, a 16-inch diameter water main, to Section 91. The existing Section 26 provides adequate service under average flow conditions. However, the line does not meet the maximum day plus fire flow service goal. The pipeline will also provide a new connection to Saugus Meter 193.

The third proposed pipeline connects to Section 91 with Section 71, and will improve the service to Nahant, Swampscott, Marblehead, Peabody, the GE facility in Lynn, Lynnfield, and Saugus. If Section 71 of the Northern High Service System was out of service, adequate service could be provided to served communities under average flow conditions. However, the maximum day plus fire flow service goal could not be met for these communities. Under normal flow conditions, either Section 71 or 91 could be removed from service for inspection, maintenance, or repair without disruption of flow to these communities.

These improvements will fully integrate the new Section 91 into the Northern High Service Distribution System. Section 91 will become the primary feed for Saugus, and its increased capacity will improve the hydraulics for the town.

Scope

Phase	Scope
Design/CA/RI	Design Construction Administration, and Resident Inspection of Section 91 interconnections to Sections 26, 68, and 71.
Land	Easements along the construction route.
Construction	Installation of a 900 foot length of 24-inch diameter water main on Park Street in Saugus to connect Section 91 to Section 68 and Saugus Meter 134; construction of a new 3,800-foot water main of 24-inch diameter pipe in Ballard Street in Saugus to complete a loop between Section 26 and Section 91, which will connect to Saugus Meter 193; and the installation of a new 5,700 linear foot, 36-inch diameter pipeline to provide a second connection between Section 91 and Section 71, forming a loop which will supply six meters serving the communities of Nahant, Swampscott, Marblehead, Peabody, the General Electric facility in Lynn, Lynnfield, and Saugus.

**Changes in
Scope Since
FY96-98 CIP**

Phase	Changes
Design/CA/RI	Deleted the design of the installation of new 1,000 linear feet of 16-inch diameter water main.
Construction	Deleted the installation of new 1,000 linear feet of 16-inch diameter water main.

CEB Impact None.

2333. Northern High Service Improvements - Lynn Pipeline

Purpose

To install a new primary supply line for the northeast section of the Northern High Service System. The furthest reaches of this service area frequently experience hydraulic deficiencies due to the inadequate capacities of existing pipelines. When this new main comes on line, it will efficiently carry high service flows to north shore communities and will reduce the need for pumping from the Spot Pond station to the Northern High System. More than seven miles of new pipeline will be constructed as part of this project.

Expenditure Forecast and Schedule

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$1,634	Apr 88	Jul 98
Construction	\$12,261	Jun 82	Jul 98
Technical Assistance	\$170	Jun 82	Jul 98
TOTAL:	\$14,065		

Project History and Background

The northeast corner of the Northern High Service System serves Marblehead, Swampscott, Nahant, Peabody, and Lynn. The existing pipelines are undersized for the current peak demand of the area. Upgrading the service entails furnishing and laying 37,750 linear feet of 48-, 36- and 24-inch ductile-iron or reinforced concrete and steel pipes, valves, and related appurtenances in Lynn.

All construction has been completed except for the 900 foot segment in Summer Street. Design relating to the removal and handling of contaminated soil continues so as to determine the level and amount of expected contamination, and the most cost effective method of remediation.

Alternative routes have been investigated, and the MWRA is negotiating with DEP to determine the least costly method of handling the hazardous waste.

Scope

Phase	Scope
Design 2/CS/RI	Design, construction services, and resident inspection of Construction Phases 2, 4, and 5.
Design /CS/RI	Design of the removal of contaminated soil, and preparation of alternative analyses for installation of a 900-linear foot pipeline on Summer Street.
Construction 2	Construction of 6,600 linear feet of pipeline through Saugus.
Construction 3	Construction of a 900 foot section on a site on Summer Street.
Construction 4	Construction of 5,000 linear feet of pipeline on Washington Street.
Gas Main-Washington St	Relocation of a gas main on Washington Street.
Traffic System-Washington St	Study for traffic control on Washington Street.
Construction 5	Installation of 10,000 linear feet of pipeline on Western Avenue.
Technical Assistance	Technical assistance in the design and construction of the pipelines.

Changes in Scope Since FY96-98 CIP None.

CEB Impact None.

2334. Northern High Service - Section 27 Improvements

Purpose To replace a segment of 98-year old pipe in Lynn which suffers from poor hydraulic performance and frequent leakage. Replacement with 7,600 linear feet of new pipeline will improve service to the communities north of Lynn.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design	In-house	Sep 96	Jul 99
Borings-Section 27	\$9	Apr 97	Jun 98
Construction	\$2,766	Sep 99	Feb 01
TOTAL:	\$2,775		

**Project
History and
Background**

Section 27 is a 12- to 20-inch diameter cast-iron main installed in 1898 which serves the communities north of Lynn. The main has become severely corroded through graphitization, a corrosion process which affects cast iron. As a result of this deterioration, nine major leaks have occurred since 1976, most of which have occurred in the last six years. Since the main runs under major thoroughfares in Lynn, repair of emergency leaks is disruptive and costly. Appropriate corrosion control methods will be employed on the new pipeline to minimize corrosion potential in Section 27. During preliminary design an evaluation will be made to determine whether an adjacent pipeline, Section 35, should be rehabilitated concurrently.

Scope

Phase	Scope
Borings-Section 27	Borings along the construction route to determine sub-surface conditions.
Construction - Section 27	Construction of 7,600 linear feet of pipeline to replace the existing severely corroded pipe.

**Changes in Scope
Since FY96-98
CIP** None.

CEB Impact None.

2335. Northern High Service-Revere and Malden Pipeline Improvements

Purpose To improve the delivering capabilities of major distribution lines serving the Northern High System. The existing pipelines are hydraulically inadequate and suffers from extensive corrosion and leakage. Replacement, rehabilitation and/or reinforcement with a new larger diameter pipeline, nearly four miles in length, will provide a strong and reliable means to convey water from the City Tunnel Extension to communities within the northern and eastern portion of the Northern High Service area.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	\$2,002	May 88	Dec 95
Construction	\$26,919	Jun 88	Jun 02
Easements	\$22	Jul 99	Jun 00
Technical Assistance	\$183	May 88	Jun 01
TOTAL:	\$29,126		

**Project
History and
Background**

The southeast corner of the Northern High Service System has experienced pressure deficiencies due to undersized pipes and extensive pipeline corrosion. The corrosion problems have led to numerous leaks, and the pressure deficiencies cause firefighting difficulties. These deficiencies particularly affect Malden, Revere, Lynn, Winthrop, Deer Island, East Boston, Saugus, Nahant, Peabody, Marblehead, and Swampscott. To correct these problems, a series of pipeline improvements have been planned for the Northern High Service region.

A hydraulic study of the MWRA distribution system recommended that a new pipeline be installed in Revere, beginning at the Everett/Chelsea/Revere border and extending through Revere to the boundary with East Boston.

This new pipeline parallels existing pipelines and carries a large portion of the flow formally carried by the existing system, thereby increasing water pressure and flow to Revere, East Boston, Winthrop, and Deer Island, particularly during periods of high demand.

Control valves were required to regulate water pressure and fill the Winthrop standpipe. The original control valves between Winthrop pipelines and the MWRA transmission mains were inadequate. Fluctuations in pressure threaten to rupture the town's pipelines. More efficient valves were required to eliminate the danger.

Flow tests performed on Sections 32 and 55 of the existing Revere and Winthrop pipeline revealed that these sections had severe flow problems. The pipeline was only able to carry a fraction of its designed capacity due to internal corrosion. Cleaning and lining the pipeline restored flow capacity.

Section 53 in Malden and Revere was an 18,900 foot long, 30-inch steel pipeline, exceeding 60 years of age. Workers dug four test pits to determine the condition of this pipeline and uncovered 18 holes in the pipe. Investigations into recent failures revealed severe corrosion through the pipe wall in several separate locations. Therefore, replacement of the entire pipeline with a 48-inch (Malden) and 36-inch (Revere) transmission main that is able to support greater water demand was required. In addition to feeding into the new 48-inch Saugus/Lynn pipeline, this pipeline will play an important role in the supply network for Deer Island. Section 49A, an old 24-inch pipeline, is used to connect Section 53 to Shaft 9A of the City Tunnel. It is undersized for this purpose and is a severe restriction. A new 3,000-foot, 60-inch diameter pipeline is needed to reinforce Section 49A. An 850-foot portion of Section 68 interconnects Section 53 with the new Saugus/Lynn pipeline. This section needs to be reinforced with 850 feet of 48-inch pipeline.

All of the work for this project, with the exception of the design and construction of Section 53, Revere 49A, and Section 68 has been completed.

Scope

Phase	Scope
Des/CS/RI-Rev/Malden	Design, construction services, and resident inspection for Section 53 in Malden and Section 97/97A in Revere.
Construction-Revere Beach	Installation of 5,491 linear feet of 36-inch pipeline and 10,111 linear feet of 30-inch pipeline on Section 97, as well as 3,872 linear feet of 24-inch pipeline, and 1,350 linear feet of 20-inch pipeline on Section 97A in the vicinity of Revere Beach Parkway.
Construction - Malden 53	Installation of 11,907 feet of 48 inch diameter pipeline in Malden on Section 53.
Landscaping	Payment to city of Malden for landscaping of traffic islands at the intersection of Route 60 and Eastern Ave.
Construction Assistance -Malden	Construction assistance for segment of Section 53 located in the Linden Square area of Malden.
Design-Revere Section 53	Design of Section 53 pipeline in Revere.
Construction - Revere Section 53	Installation of 6,000 feet of 36-inch pipe in Revere on Section 53.
Easements	Easements negotiated along the construction route of Section 53 in Revere.
Construction Assistance Linden Square	Construction assistance for the segment of Section 53 located in the Linden Square area of Malden.
Construction - Linden Square	Construction of a 1,000 linear foot segment of Section 53 in the Linden Square area of Malden. The Massachusetts Highway Department has constructed this section as part of its roadway reconstruction around Linden Square.
Design/CA-Eastern Ave Rd Restoration	Design of the full road restoration to ensure a stable road surface without cracking on Eastern Avenue in Malden.
Construction-Eastern Ave Rd Restoration	Construction of the full road restoration to ensure a stable road surface without cracking on Eastern Avenue in Malden.
Design-Control Valves	Design of the control valves needed to regulate water pressure and fill the Winthrop standpipe.
Construction-Control Valves	Construction of the control valves needed to regulate water pressure and fill the Winthrop standpipe.
Design-DI Pipe C&L	Design of the cleaning and lining of the 2,000 linear foot, eight-inch diameter water supply main to Deer Island.

Construction-C&L	Construction of the cleaning and lining of the 2,000 linear foot eight-inch diameter water supply main to Deer Island
Design/CS/RI-53A & 68	Design, Construction Services, and Resident Inspection of two new connecting mains in Malden.
Construction-53A & 68	Construction of 850 linear feet of new 48-inch pipeline paralleling Section 68 which will connect Section 51 to Section 91 and 3,000 linear feet of new 60-inch pipeline (Section 53A) which will connect Shaft 9A to Section 53.
Design-Winthrop C&L	Design of the rehabilitation of Sections 32 and 55.
Construction-Winthrop C&L	Construction consists of rehabilitation of 7,900 linear feet of 16-inch diameter pipe on Section 32 and 20-inch diameter pipe on Section 55 in Revere and Winthrop
Technical Assistance	Technical assistance for all phases of construction

Changes in Scope Since FY96-98 CIP None.

CEB Impact None

2336. Northern High Service-Pipeline Rehabilitation

Purpose To rehabilitate a number of small diameter distribution pipelines near the coastline from East Boston north to Lynn. All of these cast-iron mains are unlined with C-values below 70, and most are more than 60 years old. Improvements will primarily involve cleaning and lining and valve replacement.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CA/RI	\$2,406	Oct 00	Dec 09
Construction	\$11,327	Feb 05	Dec 09
Appraisal/Easements	\$128	Jul 04	Jun 05
TOTAL:	\$13,861		

**Project
History and
Background**

Pipeline Sections 33, 49, 54, 55, 56, and 69 in Malden, Everett, and Revere deliver water from the vicinity of Shaft 9A of the City Tunnel in Malden to the eastern and northern reaches of the Northern High Service System, including Everett, Revere, East Boston, Winthrop, Saugus, Nahant, Marblehead, and a portion of Lynn. The carrying capacity of these sections ranges from 50 to 60 percent of the original design capacity (C-Values: 61 to 73) due to a build up of rust deposits and other matter along the pipeline.

Scope

Phase	Scope
Design/CA/RI	Design, construction administration, and resident inspection of the rehabilitation of Sections 33, 49, 54, 55, 56, and 69. Exploratory excavation and corrosion analysis will be performed during preliminary design to evaluate the structural integrity of the pipe, the condition of the bedding material, and the extent of pipe corrosion.
Appraisal/ Easement	Easements to be negotiated along the construction route.
Construction	Construction which consist of the rehabilitation of 30,000 linear feet of 24-inch pipe on Sections 33, 49, 54, and 69, and 33,000 linear feet of 20-inch pipe on Sections 55 and 56. Rehabilitation is expected to consist primarily of cleaning and lining of the interior pipeline walls, as well as replacement of existing line valves, air/vacuum valves, and blow-off valves.

**Changes in
Scope
Since FY96-98
CIP**

None.

CEB Impact

None.

2337. Northern Extra High Service-New Pipelines

Purpose To improve hydraulic service and reliability for major portions of the Northern Extra High System. Existing lines are undersized and frequently experience low pressure problems. Improvements will involve rehabilitation of two pipe segments and installation of a new parallel main into Waltham.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CA/RI	\$541	Sep 94	Jun 00
Appraisal/Easements	\$22	Jul 98	Jun 99
Construction	\$2,691	Mar 99	Jun 00
Regulatory Compliance	\$1	Nov 95	Jun 96
TOTAL:	\$3,255		

**Project
History and
Background**

Sections 45, 63, and 83 provide service to the Northern Extra High communities of Waltham, Lexington, and Bedford. The existing pipelines are not large enough to meet maximum day plus fire flow service goals. The community benefits realized by a new larger pipeline will include improved reliability, pressure, and flows which will result in better fire protection and reduced pumping costs.

Scope

Phase	Scope
Design/CA/RI	Design, construction administration, and resident inspection of two pipe phases.

Appraisal/ Easement	Easements to be negotiated along the construction route.
Regulatory Compliance	Disposal of contaminated soil.
Construction-New Pipe	Replacement of approximately 2,600 linear feet of Section 45 with 24-inch diameter pipe extending from the connection point at Meter 47 to Section 82 on Park Street at the intersection of Paul Revere Road; installation of about 2,100 linear feet of new 24-inch pipeline, parallel to a portion of Section 83, starting from the Meter 182 to the intersection of Waltham Street (in Lexington and part of Waltham) and Concord Avenue (in Lexington).
Construction- Rehabilitation	Rehabilitation of Section 63, consisting of about 3,400 linear feet of 20-inch pipeline connecting Section 63 to Meter 136.

**Changes in
Scope
Since FY96-98
CIP**

None.

CEB Impact

None.

2338. Hydraulic Model Update

Purpose To update the hydraulic model to incorporate all recent capital improvements to the Waterworks system. This project also includes reconfiguring all computer data files in such way as to utilize updated software features.

Expenditure Forecast and Schedule	Phase	Total Contract Amount (\$000)	Begin date	End date
	Hydraulic Model Update	\$300	Jan 98	Jan 00
	TOTAL:	\$300		

**Project
History and
Background**

The MWRA Water System Model Study completed in 1990 by Camp, Dresser & McKee included the development of a computer based hydraulic model of the Authority’s water system. The transmission and distribution systems, pump stations, storage tanks, revenue meters, pressure reducing valves and other system appurtenances were incorporated into the model. The model was developed using software written by Stoner Associates, Inc. One of the main reasons for selecting Stoner was its ability to directly access databases on demand (Central Monitoring), Geographical Information Systems (GIS), and Supervisory Control and Data Acquisition Systems (SCADA).

The existing VAX/VMS operating system platform was changed to the desktop PC environment to make the model more accessible and user friendly to staff and because the software developer discontinued upgrading the former platform.

In addition to the recent improvements made to the computer hardware and software in the regards to the model, current Stoner data files need to be updated and enhanced. Some of the enhancements in the Stoner for Windows software include the ability to have a geographically accurate model, the ability to separate the whole system into individual service areas, model water quality, and efficiently update the system operational conditions through links to other maintained databases, including on-line modeling.

Since the hydraulic model was developed, an attempt has been made to keep pace with changes in the distribution system by incorporating new pipes into the model and periodically issuing new base files to the users. However, several other changes will benefit the hydraulic model, including the addition of appurtenances, updating community demands and updating our facilities that are undergoing rehabilitation.

This project will include updating the hydraulic model to reflect the MWR's current system, including a geographically accurate model, individual pressure zones, addition of appurtenances, updating demands, and facilities. The model will also be reconfigured in such a manner that the model users will have the ability to link to and obtain information from the OCC, GIS databases, and in the future, the SCADA databases. The work will include calibrating the updated model through field testing performed by Distribution Section staff.

Scope

Phase	Scope
Hydraulic Model Update	Software revision to the computer based hydraulic model of the Authority's water system.

**Changes in
Scope
Since FY96-98
CIP**

New project in the FY97-99 CIP.

CEB Impact

None.

2401. Central Monitoring System Expansion

Purpose To provide a modern centralized system for monitoring, coordinating, and controlling critical waterworks functions. Many existing facilities are monitored and operated using obsolete methods and equipment, which can hinder emergency response capabilities and prevent coordinated system operation. An Operations Control Center is already operational, and various field facilities have been equipped with telemetry and communications equipment as part of this project.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Study	\$190	Mar 84	Sep 86
Design/CS	\$3,372	Oct 87	Aug 98
Construction	\$5,679	Nov 92	Aug 99
Equipment Prepurchase	\$2,925	Oct 87	Mar 99
Utility Installation	\$29	Aug 96	Aug 98
Technical Assistance	\$320	Jul 92	Aug 99
TOTAL:	\$12,515		

**Project
History and
Background**

The Waterworks Division is planning to convert to system-wide remote monitoring and control of essentially all hydraulic and hydroelectric operations. The existing instrumentation used to measure operating parameters is incomplete, old, and in poor condition. In many cases necessary instrumentation does not exist. The current system also lacks telemetry to provide centralized and immediate information on system performance, and the ability to remotely intervene when malfunctions occur. Without telemetry, operating decisions are delayed until field personnel are dispatched to collect measurements. This is a cumbersome and undesirable mode of operation, particularly in emergency situations.

The lack of flow measurement within the water delivery system also impedes identification of sources of un-metered water. The central monitoring system will generate instantaneous data on water flow and pressure in 18 subsystems beginning with the supply sources and ending at the delivery points to user communities. The data will enable operations staff to detect and pinpoint leaks in the system. The response time for leak repair work can then be lessened, resulting in significant savings of water and reduction in potential MWRA liability for public safety and property damage.

Scope

Phase	Scope
Study	Study to determine the implementation phases.
Design	Design of the replacement and rehabilitation of 34 existing master meter sites, 22 new master meter sites, 15 western revenue meter sites, 28 reservoir level instrumentation sites, ten pumping stations, eight pressure regulator control sites, four major throttle valve sites, six chemical feed sites, four hydroelectric sites, five weather stations, five sluice gate control sites, one stream gaging station, and other facilities within the waterworks system.
Design - Operation Center	Design of the 5,000 square foot center including an environmentally controlled computer room, a printer room, a control room, office space, and sanitary facilities.
Construction Services	Construction services for operation control center as well as metering and monitoring construction.
Communication Structures	Installation of two new radio towers, five antennas, one satellite dish, and an equipment shelter.
Construction 1: Bondsville and Wilbraham	Construction consists of the rehabilitation of the Bondsville throttling valves and the Chicopee and Wilbraham meters.
Construction 2: Reservoir Road and Cosgrove Pilots	Purchase of equipment to automate the Reservoir Road pumping station and an aqueduct monitoring system for use by the Cosgrove Intake and Shaft 4 operators. This work will be performed by in-house staff.
Construction 3: Metering and Monitoring	Purchase of Supervisory Control and Data Acquisition System (SCADA) equipment for monitoring and metering sites and pressure reducing valve sites. This work will be performed by in-house staff.

Construction - Operations Center	Construction of a 5,000 square foot center including an environmentally controlled computer room, a printer room, a control room, office space, and sanitary facilities.
Equipment Prepurchase	Purchase of instrumentation equipment, mechanical equipment, and new master meters.
Microwave Improvements	Purchase of services and equipment necessary to allow MWRA to convert from analog to digital communications to continue to utilize the Commonwealth's Interagency Microwave System.
Utility Installation	Connections of SCADA equipment to local utilities.
Technical Assistance	Technical assistance in the design and construction of the Operations Control Center and related equipment installation.

Changes in Scope Since FY96-98 CIP

Microwave Improvements	New phase in FY97-99 CIP.
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CEB Impact

CEB Line Item	Incremental Cost in FY98	Incremental Cost in FY99	Description
Labor	\$0	\$0	
Maintenance	\$20,000	\$10,000	Technical support for the Oracle-SCADA software.
Professional Services	\$0	\$0	
Electricity	\$10,000	\$10,000	Additional usage.
Telephone Data Lines	\$2,500	\$0	Additional data lines.
TOTAL	\$32,500	\$20,000	

2402. Rehabilitation of Existing Facilities

Purpose To repair and upgrade various field facilities by improving buildings, tanks, bridges and grounds. Waterworks facilities are generally in deteriorated condition due to several decades of deferred maintenance and under-investment. Improvements include underground tank replacements, water tank inspection and rehabilitation, pipe and road bridge repairs, and miscellaneous equipment upgrades.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Design/CS/RI	In - house	May 89	Sep 07
Testing	\$41	Jan 91	Jun 91
Subsurface Investigation	\$563	Jul 91	Jul 99
Water Tank Inspection	\$27	Oct 94	Nov 94
Facility Maintenance Equipment Purchase	\$500	Oct 95	Mar 97
Construction	\$3,936	Aug 92	Sep 07
Technical Assistance	\$16	Jul 91	Aug 99
Facilities Maintenance Program	\$4,000	Jul 96	Jun 00
TOTAL:	\$9,083		

**Project
History and
Background**

Due to the advanced age of the Waterworks Division's facilities, major repairs are needed to restore the existing buildings and other structures to proper operational condition. This project is an ongoing program to evaluate the condition of facilities, to identify priority improvements necessary for the safety and welfare of MWRA staff and to ensure operational reliability, and then systematically rehabilitate all waterworks facilities in need of repair.

The Waterworks Division has a number of underground fuel tanks located at various facilities. U.S. EPA, DEP, and Department of Public Safety regulations require that all tanks be tested, that any defective tanks be replaced, and that any contaminated soil and water be remediated.

Scope

Phase	Scope
Testing	Testing of fuel tanks to evaluate operational status and condition of surrounding soil.
Design - Hyde Park	Design of the rehabilitation of the Hyde Park Pump Station which houses 12 employees and is staffed 24 hours per day.
Construction-Hyde Park	Rehabilitation includes installation of new windows, doors, showers and locker room, rest rooms, an electrical power generator, a new roof, a new boiler, a new sound enclosure for a diesel pump engine, and electrical updating.
Subsurface Investigation	Environmental assessment of sites contaminated by leaking fuel tanks.
Design - Tank Removal Phase 1	Design for the removal of 16 out of service tanks from various locations.
Construction-Tank Removal Phase 1	Removal of 16 tanks from the following locations: construction field office in Stoneham, R. Lonergan Intake (Shaft 8) in South Barre, Mystic Shops in Somerville, Nash Hill Reservoir Service Building in Ludlow, Norumbega Reservoir and Weston Reservoir in Weston, Reservoir Road Pump Station in Brookline, Glenwood Yard in Medford and Chestnut Hill Pipe Yard in Brighton. Removal and disposal of all contaminated soil at these locations.
Design Tank Removal Phase 2	Design for the removal of four out of service tanks from various locations.
Construction-Tank Removal Phase 2	Removal of four tanks from the following locations: Glenwood Yard, Lake Cochituate in Natick, and Quabbin Aqueduct - Shaft 9 in Barre. Removal and disposal of all contaminated soil at these locations.
Design Tank Removal Phase 3	Design of the removal of one tank at Shaft 8.
Construction-Tank Removal Phase 3	Removal of one tank at the R. Lonergan Intake (Shaft 8). Removal and disposal of all contaminated soil at this location.
Design/CS/RI - Tank Replacement	Design, construction services and resident inspection for the replacement of various fuel tanks.
Construction-Tank Replacement	Replacement of active service tanks along with the remediation of any contaminated soil and/or water.
Design/CS/RI-Newton St. Bridge	Design, construction services and resident inspection of a pipe bridge, which is a 30-inch pipe over two railroad rights-of-ways which have been in service for 60 years.

Construction-Newton Street Bridge	Replacement of the pipe over a railroad right-of-way; insulation and covering for the pipe.
Water Tank Inspection	Inspection of the existing interior and exterior paint systems on five of the system's water tanks that have exceeded their useful lives.
Design - Water Tank	Design for the inspection, structural repair, and repainting of five water tanks.
Construction-Water Tank	Structural repair, and repainting of five water tanks.
Design - Stony Brook	Design of the bridge, which is a 14-foot wide concrete arch spandrel structure spanning 30 feet.
Construction -Stony Brook	Dismantling and rebuilding approximately 100 feet of spandrel wall, replacing bridge railings, and installing an electrical ductbank. Rebuilding of the wall will require excavation adjacent to the bridge. A concrete line plug will be installed underground in preparation for the Sudbury valve replacement (Dam Control Valves). This plug insertion will be completed as part of this project to avoid redundant excavation and potential undermining of the bridge structure.
Design/CS/RI - Mystic River	Design, construction services and resident inspection of the rehabilitation of the bridge girders, pipe supports, and cross bracing which are corroded.
Construction-Mystic River	Rehabilitation of the Mystic River Bridge girders, pipe supports, and cross bracings. Rehabilitation consists of repairing, sand blasting, and painting the girders; installing new pipe joint clamps; installing a new wood deck; replacing the handrails; repointing the granite abutments; and installing a handicapped access ramp.
Facility Maintenance Equipment Purchase	Purchase of capital equipment and materials necessary to allow in-house staff to repair of Waterworks facilities.
Facilities Maintenance Program	A comprehensive evaluation, prioritization, and repair and rehabilitation program designed to systematically address capital improvement needs for all waterworks building.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Facilities Maintenance Program	New phase.
Facility Maintenance Equipment Purchase	Added budget for FY97 winter work program.

CEB Impact None.

2403. Distribution Systems Facility Mapping

Purpose To produce a complete, up-to-date set of appropriate scale maps of all underground Waterworks facilities, along with a comprehensive database inventory. Existing maps are outdated and unreliable, which complicates emergency response, field repairs, and planning.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Planning/Design/Data Purchase	\$648	Feb 95	Aug 98
Data Purchase	\$100	Aug 96	Nov 96
TOTAL:	\$748		

**Project
History and
Background**

The Waterworks Division does not have an adequate, updated set of maps of all of its underground facilities. Existing maps do not consistently show current conditions and are often incompatible or contradictory with MWRA databases. Engineering, operations, and emergency response are all affected by this inadequacy. Outdated maps hamper engineering because maps must be re-created. Field operations crews cannot predict with certainty the results of valve shut-offs during repair efforts. The planning process is impaired because management does not have authoritative, consolidated data to evaluate pipe condition, age, C-Values, materials, and soil conditions. Additionally, the lack of a comprehensive understanding of the relationships between MWRA and local community pipe systems can result in service delays. The current mapping system creates the possibility of incorrect actions, and in critical instances could result in exacerbated property damage.

Scope

Phase	Scope
Planning/Design	Creation of a complete set of 200 to 400 scale maps of the distribution system with an associated, verified inventory of size, material, age, and condition of pipes.
Data Purchase	Purchase of project related data from Boston Edison.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Data Purchase	New phase.

CEB Impact None.

2404. Local Water Infrastructure Rehabilitation Assistance Program

Purpose To provide financial support to local communities to replace, rehabilitate, and maintain their waterworks infrastructure.

Expenditure Forecast and Schedule	Phase	Total Contract Amount (\$000)	Begin date	End date
	Loans	\$30,000	Jan 98	Dec 99
	Repayments	(\$30,000)	Jan 99	Dec 04
	TOTAL:	\$0		

Project History and Background The MWRA is committed to providing cost effective, high quality water services that protect public health, promote environmental stewardship, and maintain customer confidence. Part of that mission is assisting member communities in providing high quality water from source to tap. This project is designed to assist local communities in obtaining capital to replace, rehabilitate, and maintain waterworks systems.

Objectives:

- To encourage communities to realize as much benefit as possible from the MWRA's planned waterworks capital program - the MetroWest Tunnel, covered storage, and the Walnut Hill Water Treatment Plant.
- To provide a financial mechanism to local communities to support local water infrastructure maintenance and rehabilitation.

Proposed characteristics of the program:

- \$30 million over three fiscal years (\$7.5 million in FY98, \$15 million in FY99, and \$7.5 million in FY2000) in loans to communities.

- Five-year interest free loans allocated based on communities' share of MWRA water charges.
- Repayment in five equal installments.
- No local match required.
- Guidelines for project eligibility to be developed by the MWRA and the Advisory Board.

Scope

Phase	Scope
Loans	Loans for MWRA water communities to replace, rehabilitate, and maintain their local water infrastructure.
Repayments	Repayment of the loans collected from participating MWRA water communities.

**Changes in
Scope
Since FY96-98
CIP
New Program**

Phase	Change
Loans	New program.
Repayments	New program.

CEB Impact None.

ADMINISTRATION



3101. North Maintenance Facilities

Purpose To improve waterworks and sewerage staff operations by consolidating maintenance, operations, and equipment storage functions into a single new distribution facility serving the northern service area. This will relieve current maintenance operations overcrowding and adverse traffic impacts on neighborhoods abutting existing facilities. In addition, rehabilitate existing maintenance facilities at the Mystic Shops and Glenwood Yard.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Land/Building	\$4,273	Jul 96	Mar 97
Design/RI/Construction Services	\$2,648	Apr 90	Oct 01
Construction	\$11,128	Jul 99	Oct 01
Technical Assistance	\$9	ongoing	
TOTAL:	\$18,058		

**Project
History and
Background**

When the MWRA was created in 1986, 80 employees and 22 vehicles were transferred from the MDC to the MWRA to support maintenance of the metropolitan waterworks system and the northern sewerage system. Over the past nine years, the Authority has invested in improved maintenance and repair of the systems. As a result, there are now 300 employees, 188 vehicles, and 50 pieces of heavy equipment devoted to maintenance activities in the north.

Despite the growth in personnel and equipment, the MWRA has not upgraded its northern maintenance facilities, with the sole exception of leasing some temporary space.

To facilitate an upgrade, the MWRA adopted the 1993 North Maintenance Facilities Plan. The plan calls for purchase of one new site to centralize Waterworks maintenance, and rehabilitation of two existing sites (Glenwood Yard and Mystic Shops) to house Sewerage maintenance crews. The plan also calls for rehabilitation of the Chestnut Hill Pump Stations and surplusing of three sites which the MWRA will no longer need. Upon completion of the planned work, the Authority will also be able to terminate its lease for temporary space at Linden St. in Somerville.

Waterworks maintenance crews are currently located in four sites: Linden Street, Chestnut Hill, Mystic Shops, and Glenwood Yard. The plan recommends purchase of a new site for a Distribution Maintenance Facility to replace the overcrowded Glenwood Yard site. The plan also calls for relocation of the trade shops at Mystic Shops to the new Distribution Maintenance site for purposes of consolidation and efficiency. To increase operational efficiency further, the MWRA's vehicle maintenance satellite facility at Linden Street will move to the new Distribution Maintenance Facility where most of the maintenance vehicles will be located. The Somerville Laboratory will also be relocated to the new site.

Sewerage Division crews are currently located at Winchester Yard, Linden Street, Mystic Shops, and the Charlestown Pump Station. The plan calls for consolidation at two sites, Mystic Shops and Glenwood Yard. Mystic Shops will house all sewerage trade shops, the metering maintenance crew and the TV inspection program. Glenwood Yard will house the administrative staff and maintenance crews for the Transport Department. In addition, TRAC sampling staff will also move to Glenwood Yard.

The North Maintenance Facilities Plan will result in the MWRA vacating three facilities: the East Boston Steam Station, the old Charlestown Pump Station, and Winchester Yard. The plan is to surplus these facilities back to the Commonwealth of Massachusetts, consistent with the MWRA Enabling Act which governs disposition of property which no longer has a waterworks or sewerage system use.

The entire North Maintenance Facilities Plan will be completed in FY2001 and result in adequate housing of the maintenance crews and equipment for the next 50 years.

The Waterworks Division is responsible for the Chestnut Hill and Distribution Maintenance phases. The Sewerage Division is responsible for the Mystic Shops and Glenwood Yard. The Law Division is responsible for the legal process required to surplus the Winchester, East Boston, and Charlestown Pump Station properties.

Scope

Phase	Scope
Design/CS/RI: Chestnut Hill	Engineering and design services to support planning for Chestnut Hill.
Design/CS/RI: Distribution - Maintenance Facility	Design for construction of a Waterworks Distribution Maintenance Facility.
Land/Building: Distribution - Maintenance Facility	Purchase of a site for a Waterworks Distribution Maintenance Facility to replace the Glenwood Yard/Mystic Shops and Chestnut Hill sites.
Construction: Distribution - Maintenance Facility	Renovation of the Distribution Maintenance Facility includes a building, enclosed fleet vehicle area, covered storage, and open area storage.
Design/CS/RI: Mystic Shops	Design for construction of the Mystic Shops phase of the project.
Construction: Mystic Shops	Rehabilitate the Mystic Shops facility.
Design/CS/RI: Glenwood Yard	Design for construction of the Glenwood Yard phase of the project.
Construction: Glenwood Yard	Rehabilitate the Glenwood Yard facility.
Technical Assistance: Glenwood Yard	Provide technical assistance to support Glenwood Yard rehabilitation.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Design/CS/RI: Chestnut Hill	Reduced the amount of funds for design.

CEB Impact There will be moving expenses associated with the four operating area relocations. Operating and maintenance expenditures are expected to be similar to those experienced at the current facilities.

3102. Fore River Preservation

Purpose To maintain the integrity of the Fore River Staging Area (FRSA) located in Quincy for the support of the Boston Harbor Project and other MWRA activities while assessing disposition and development strategies and decisions.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
21 contract phases	\$9,268	Oct 88	Nov 97

**Project
History and
Background**

In October 1987, the MWRA purchased the General Dynamics Shipyard in Quincy for \$49.5 million. The site was purchased to provide a material laydown and staging area for the construction on Deer and Nut Islands. Additionally, the MWRA's residuals processing facility is located at the FRSA. Approximately 51 acres have been designated for use on various construction contracts, and seven acres are required for the residuals facilities. At one time, the MWRA leased approximately seven acres of surplus space to the Fore River Shipyard and Iron Works to operate a ship repair facility which is no longer in operation. In addition, approximately ten acres of space and one building at the northern end of the site have been leased by the United States Naval Shipbuilding Museum. Presently, the MWRA is in the final stages of negotiations with a shipbuilder to purchase approximately 130 acres on the central and southern portions of the site. Until disposition and development decisions are made, it is imperative that the MWRA protect the value of land, buildings, vehicles, and equipment it has acquired.

The MWRA is committed to prudent investment in this facility. As investments are proposed, the Sewerage, Program Management, Support Services, and Finance Divisions jointly analyze the need for investment.

This process has resulted in the decision to move a Sewerage Division storage facility from a badly deteriorated building at Fore River to another larger facility which required only minor repairs.

This decision not only eliminated the need for costly renovations, but also eliminated the need to construct an additional pre-fabricated building proposed by the Sewerage Division for additional storage on Deer Island.

In order to maintain the integrity of the FRSA for harbor projects and other MWRA activities, 18 phases of repair or rehabilitation work have been identified. They include the replacement of cathodic protection systems, rehabilitation of Building #14, replacement of a water meter, repair of support equipment, and the installation of back-flow preventers and rectifiers.

Three of the five dry dock gates at the FRSA suffered from extensive corrosion. Two of the dry dock gates were leaking, and the problem was kept in check through continual pumping. The installation of cathodic protection will prevent further deterioration of the dry dock gates, but is not sufficient to prevent eventual failure of the dry dock gate.

Three elevators in the FRSA were repaired in order to meet state inspection and certification requirements. One of the repaired elevators is housed in the main office building, the second is required to make periodic inspections of a PCB transformer, and the third is in Building #4 and is required for material transportation.

Buildings #15 and #16 at the FRSA were erected in 1917 and are badly deteriorated. A structural analysis of the buildings was performed and renovations were made in accordance with Massachusetts Historical Commission guidelines.

The FRSA facility had six transformers which contained PCBs, considered a hazardous substance. One transformer could not be used either by MWRA or any other potential user of the facility. Although the transformer was encased, it was possible that a leak could develop resulting in pollution to the Weymouth Fore River, which is 30 feet from the transformer. The transformer has been removed and sent to a licensed disposal facility.

A 400,000 gallon water tank provides a water supply to the diesel booster pumps in the event of a significant fire. The tank is an integral part of the FRSA fire protection system. The water tank was drained several years ago because the low level of activity in the FRSA did not require this protection. With the increase in activity, the MWRA must reactivate the tank to increase its fire protection capability in order to maintain a favorable insurance rate.

The fire alarm system at the FRSA was a slow response, antiquated system which was not compatible with the City of Quincy's system. The system was upgraded to current standards

Core and soil samples are preserved because they not only provide information crucial to engineering and construction, but also provide a physical record of the material in which pipelines and tunnels are situated. Storage capabilities were inadequate to preserve the samples, and the volume of samples requiring storage is expected to increase more than six fold due to the planned increase in capital projects. The second floor of Building #52 at the FRSA has been renovated to provide for adequate geological samples storage.

Many of the mechanical devices at the Fore River, such as elevators, cranes, and battery chargers, operate on direct current power. These devices are currently powered using the 2,100 horsepower generator. Since the vast majority of direct current devices will not be used during construction of the treatment plant, operating the powerful generator wastes energy. Furthermore, the direct current cables have developed insulation leaks which may accelerate corrosion in underground piping. The installation of rectifiers will permit more efficient use of power.

A survey of the steam pipe thermal system revealed that more than 15,000 linear feet of the pipe on the exterior of the FRSA buildings is covered with asbestos insulation. Although 10% of the material which fell on the ground had already been removed, the remainder of the material will continue to degrade, flake off, and fall to the ground, creating a serious health hazard to the work force in the area and significant potential liability for the MWRA.

Building #86 is a 52-year old, single story wooden building with a concrete floor and gravel roof. It is painted with lead based paint, contains asbestos insulation, and is need of repair. The lead concentration of the paint is 33.6 times the acceptable limit. The chipping lead based paint has become a health hazard and must be removed. The building will not be used by the MWRA and estimated demolition costs are less than estimated repair costs.

A small segment of railroad track on the branchline in Braintree near the Conrail merge is a potential hazard. As a buried trestle deteriorates, train loads would be transferred to an embankment of unstable soil. Therefore, improvements must be made to the embankment to enable it to support these additional loads

Building #19 is a 28,500 square foot, two-story building which currently does not meet minimum safety standards and is energy inefficient. The building is needed to eliminate overcrowding and substandard working conditions for South System Sewerage Division staff from the Transport Department, and the South Maintenance Yard. The facility will also include space for a carpentry and welding shop and will house one vactor jet truck and one sewer jet truck, as well as construction equipment and vehicles. The sewer jet trucks must be garaged because they are not designed to withstand sub-freezing temperatures.

The purpose of the FRSA Upland Phase II contract is to prepare these buildings for long-term storage and warehousing use for Deer Island and other MWRA facilities. The decision to use Building #1 for centralized warehousing and Deer Island spare parts storage has allowed a substantial reduction in the size of the dry storage building planned for Deer Island. Renovations to Building 4 will enable the MWRA to consolidate all of the Authority's records into a central Records Center (including the core borings) while vacating the buildings in the proposed sale area.

Design for all improvements have been completed in-house or through technical assistance consultants. The Support Services Division is responsible for all phases of this project except the rehabilitation of Building #19 and the embankment improvements, which are the responsibility of the Sewerage Division.

Scope

Phase	Scope
Cathodic Protection	Cathodic protection of three drydock gates.
Repair Elevators	Repair three elevators; decommission all others.
Rehab Bldgs 15 & 16	Rehabilitation included renewal of the roofs, repairs to the brick and mortar, window and door repair and replacement, and renovation of existing walls.
Rehab Bldg 14	Refurbish first floor.
FRSA Water Meter	Replacement of one water meter.
FRSA Repair Equip.	Repair, clean, calibrate, and service support equipment.

Back-flow Preventers	Installation of back-flow preventers.
PCB Transformer	Remove and send one transformer containing Polychlorinated Biphenyls (PCB) to a licensed disposal facility .
Water Tank Constr.	Install an electric heating system, corrosion protection, and insulation to reactivate a 400,000 gallon water tank.
Fire Alarm Upgrade	Installation of 10,000 linear feet of new cable from Quincy Fire Department Headquarters to the FRSA and replacement of wiring and retrofitting of 35 pull boxes.
Geological Storage	Renovation of the second floor of Building 52, including replacement of windows and doors, installation of insulation, sheet rock, fire sprinklers, fluorescent fixtures, and a seven kilowatt heater.
Install Rectifier	Installation of rectifiers to eliminate reliance on DC power system.
Asbestos Removal	Removal and disposal of 13,500 linear feet of exterior asbestos pipe insulation.
Demolition - 86	Demolish Building 86.
Embankment Improvements	Repairs consist of adding sidehill fill to areas along an embankment of unstable soil.
Building 19 Rehab	Rehabilitation consists of cleaning and demolition; replacement of energy-inefficient doors and windows; electrical system improvements; and installation of new HVAC, plumbing, and fire protection systems, interior partitions, floor coverings, ceilings, and a new interior staircase. Backhoe expenses for the Transport department is transferred from the CEB.
ESDC - Bldg 19	Engineering services to support Building 19 rehabilitation work.
Tech Asst - Bldg 19	Technical assistance to support Building 19 rehabilitation.
Geological Shelving	Industrial strength shelving required to store core samples in the newly renovated records storage area.
FRSA Upland Phase II	This contract will complete the rehabilitation of Buildings #1 and #4, including interior build-out of storage and office facilities as well as reconstruction of substation #1, which is needed to provide reliable power to these and other FRSA buildings.
Dry dock Pumps	The purchase of pumps required to de-water the dry docks.
Equipment Inspection	The purchase of a TV inspection truck required to conduct internal infrastructure inspection.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Geological Shelving	New phase. Required to store core samples in the newly rehabilitated Building 4.
FRSA Upland Phase II	Transferred phase from PMD.
Dry dock Pumps	New phase. Will be eliminated if FRSA is sold.
Hazardous Waste	Transferred phase from Wastewater.
Inspection Equipment	New Phase.

CEB Impact None.

3103. Technical Assistance

Purpose To ensure ready access, on an as needed basis, to professional and technical services not available from in-house staff.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Technical Assistance	\$5,138	Dec 91	Aug 98
TOTAL:	\$5,138		

**Project
History and
Background**

Efficient implementation of the MWRA's Capital Improvement Program often requires specialized skills and technical assistance which are not available from in-house staff. This project ensures ready access to a variety of skills on an as needed basis through a series of task order contracts with pre-set limits. A division director can request a task order when immediate expertise on capital projects is required.

This project budget includes funds for actual and projected use of technical assistance for FY97-99. Charges incurred through the first quarter of FY96 are included in the FY97-99 CIP project budgets which utilized these services.

Scope

Phase	Scope
Technical Assistance	Technical assistance contracts include the following engineering and other skills: sanitary, electrical/HVAC, mechanical, structural, materials testing, environmental testing, geotechnical, surveying, hazardous materials assessment, asbestos assessment and design, architecture/landscaping, instrumentation/control, wetland/environmental, civil engineering, land appraisal, cost estimating, and energy.

Changes in None.
Scope
Since FY96-98
CIP

CEB Impact None.

3104. Business Systems Plan

Purpose To adapt to the changing business needs of planning and managing the waterworks and sewerage systems, the MWRA initiated a business system planning effort to develop and procure management information systems (MIS) in support of business functions.

**Expenditure
Forecast
and Schedule**

Phase	Total Contract Amount (\$000)	Begin date	End date
Phase I (FY95-97)	\$2,053	Jul 94	Jun 97
Phase II (FY97-99)	\$2,395	Jul 96	Jun 99
Phase III (FY99-01)	\$0	Jul 98	Jun 01
Building 36 - Generator	\$229	Oct 94	Dec 95
TOTAL:	\$4,677		

**Project
History and
Background**

During the budget development process for the FY94-96 Capital Improvement Program, it became clear that future capital investments would be required to upgrade, enhance, and potentially expand the MWRA management information systems (MIS) in order to adapt to the changing business needs of planning and managing the waterworks and sewerage systems, and to respond to new regulatory requirements. In order to address these needs, the MWRA initiated a business systems planning effort to determine its future MIS support requirements

Because of rapidly changing technology and limits on the MWRA's ability to forecast long-term MIS needs, the decision was made to have the initial business systems plan focus primarily on the FY95-97 period (Phase I), with updates occurring every year thereafter. The MWRA anticipates that publication and annual updates of the plan will assist staff, external constituencies, and the Board of Directors in understanding the critical role of information systems in carrying

out the MWRA's environmental and economic mission.

In addition, the plan provides comprehensive documentation for future resource requirements.

In January 1993, work group sessions led by a planning support team of MIS and Rates and Budget Department staff were conducted with the Sewerage and Waterworks Divisions. The plan incorporated maximum reuse of existing assets and captures economies through shared databases, applications, and hardware.

In early 1996, Phase II (FY97-99) was introduced to the Board of Directors. This phase builds on the progress made during Phase I and continues to consolidate the work of MWRA information systems. Phase II continues to develop economies of scale through optimization of existing assets, technology conversion promoting database integration, and infrastructure improvement. The objective of Phase II is to increase staff productivity and seek cost savings where applicable. The proposed changes complement the MWRA Business Planning efforts currently underway. Phase III (FY99-01), to be developed in 1998, will further enhance MWRA-wide work process improvements.

Scope

Phase	Scope
Phase I (FY95-97)	<p><u>Hardware:</u> Upgrade Boston Harbor Project technical minicomputers; purchase a Unix based minicomputer for GIS integration and consolidation and work stations for high-end modeling (SAMS) and mapping functions; upgrade/replace PCs; improve storage requirements for the TRAC IS and wastewater flow data; and lease three replacement minicomputers for administration and finance systems to address capacity and performance issues.</p> <p><u>Software:</u> Implement and enhance the Sewerage Analysis and Management System (SAMS) to incorporate improved hydraulic modeling capabilities, condition information, mapping, and GIS data so that CSO Master Plan and Transport data requirements are met.</p> <p>Upgrades and enhancements to the TRAC/IS to address improved enforcement, monitoring, permitting, and integration of information with other systems.</p> <p>Upgrade the GIS application to the industry standard to allow more integration and analysis of data.</p>

<p>Phase I (FY95-97) continued...</p>	<p>Implementation of CADD software and related tools including, the establishment of a document management system to index thousands of engineering documents maintained by the Records Management Center and Sewerage Technical Information Centers at both CNY and Deer Island.</p> <p><u>Network:</u> Replacement of obsolete software used for access to administration, finance, and technical minicomputer applications.</p> <p>Develop a network plan for future BSP updates that address industry changes, maintenance/replacement concerns, and functionality needs.</p>
<p>Phase II (FY97-99)</p>	<p>Phase II consists of eight elements key to the continued productivity of MWRA staff. The eight elements are: (1) server consolidation, (2) network scalability program, (3) database integration program, (4) PBX replacement, (5) electronic records program, (6) procurement replacement, (7) maintenance management, and (8) waterworks programming services.</p> <p><u>Server consolidation:</u> Improvement of the storage capacity, availability and manageability of the servers used by MWRA staff. This includes consolidating the 30 individual, independent file servers to approximately five, while avoiding the cost of hiring several server administrative staff to manage the resources.</p> <p><u>Network scalability program:</u> Improvement of the data network by increasing the data access and retrieval to meet current and projected demand over the next several years.</p> <p><u>Database integration program:</u> Standardize the programming/database environment between portfolios by converting to Oracle-based systems (the standard for water and sewer systems) and consolidating/integrating data across the organization. Thus providing improved reporting and programming resource management at overall lower cost by avoiding large increases in positions.</p>
<p>Phase II (FY97-99) continued...</p>	<p><u>PBX replacement:</u> Replacement of the current Siemens Private Branch exchange (PBX) switches at the Charlestown Navy Yard with equipment that has a projected useful life of 10 years. Neither the PBX system or replacement parts are currently manufactured resulting in high risk of extended and/or complete system failure.</p> <p><u>Electronic records program:</u> Establishment of computing resources, procedures, and training necessary to satisfy audit and good practice requirements for security and file management; and expected federal/state regulations regarding electronic public records.</p> <p><u>Procurement replacement:</u> Replacement of the existing software (Purchase Stores Inventory or PSI) that is obsolete and will not be upgraded/updated by the vendor.</p>

	<p><u>Maintenance management</u>: Automated maintenance software and corresponding hardware to replace obsolete Hewlett Packard maintenance software where it is currently used, and to provide systems support for areas currently using manual tracking methods.</p> <p><u>Waterworks programming services</u>: Programming services to meet the requirements of water quality testing as a result of the water quality work process improvements being conducted as part of the business planning process.</p>
Phase III (FY99-01)	To be determined.
Building 36 Generator	Purchase and installation of a back-up generator for Building 36 in the Charlestown Navy Yard.

**Changes in
Scope
Since FY96-98
CIP**

Phase	Change
Phase II (FY97-99)	New phase.
Phase III (FY99-01)	New phase.

CEB Impact

CEB line item	(\$000)				Description
	FY98	FY99	FY00	FY01	
Other	\$57	\$102	\$130	\$240	Maintenance, licensing fees, and electronic records management.

4001. Capital Budget Contingency

Purpose	<p>There are certain costs associated with the Capital Improvement Program that are not possible to predict with any degree of certainty. These costs include legal fees, settlement of claims, acquisition of land, and a variety of study, design, and construction change orders and contract amendments.</p> <p>A capital budget contingency is needed to authorize the expenditure of funds to cover these costs. The amount necessary for the contingency is calculated using the methodology described below. At the end of each fiscal year, any remaining funds in the contingencies lapse and new contingencies are created based on the new fiscal year budgets for the projects.</p>
Boston Harbor Project	<p>For non-tunnel Boston Harbor related projects the contingency is 10% of annual expenditures. The contingency for tunnel construction is 15% of annual expenditures because of the greater risks of tunnel construction. The BHP contingency fund is monitored and reported separately, and no transfers between the contingency funds are permitted.</p>
Other Projects	<p>A separate contingency fund, the “Other Projects “ contingency fund, provides the contingency for all non-BHP projects and is calculated as 10% of the annual expenditures for all other Wastewater, Waterworks, and Administration capital projects.</p>
MetroWest Tunnel	<p>The MetroWest Tunnel project will utilize the Other Capital Projects contingency fund. The total contingency amount calculated for the MetroWest Tunnel project is 15% for all tunnel contracts and 10% for all other phases. The MetroWest Tunnel contingency is also allocated so that there are more contingency funds available in the latter half of the construction schedule. The objective of this approach is to provide more contingency funds when a greater number of change orders and claims are likely to be processed and settled.</p>
Summary	<p>The total contingency required for the \$3.1 billion ten-year (FY97-06) program period is \$309 million. The three-year contingency budget (FY97-99) period is \$117.2 million.</p> <p>The MWRA contingency budget policy is included in Appendix D.</p>

Detail of Projected Contingency

<u>Fiscal Year</u>	<u>Boston Harbor Project Contingency</u>	<u>Other Capital Projects Contingency</u>	<u>TOTAL</u>
1997	\$26,761	\$15,102	\$41,863
1998	19,529	19,782	39,311
1999	14,824	21,241	36,065
2000	4,922	39,739	44,661
2001	0	52,418	52,418
2002	0	39,205	39,205
2003	0	27,035	27,035
2004	0	14,159	14,159
2005	0	8,459	8,459
2006	<u>0</u>	<u>5,935</u>	<u>5,935</u>
TOTAL	\$66,036	\$243,075	\$309,111

APPENDICES



APPENDIX A
MWRA ACCOMPLISHMENTS: COMPLETED CAPITAL PROJECTS
(AS OF JUNE 1996)

WASTEWATER PROJECTS

Project	Total Cost (\$000)	Completion Date	Accomplishment
Residuals Management -Interim Phase	99,777	Feb 92	Terminated sludge discharge to Boston Harbor
East Boston Pump Fac.	48,160	Jan 93	Eliminated sewage backup
Clinton Wastewater Treatment Plant	37,035	Sep 92	Improved water quality
Charlestown Pump Station Replacement	35,700	Apr 93	Ensured efficient pumping operations
D.I. Pump and Power Station Upgrading	31,953	Feb 91	Prevented sewage surcharges
D.I. Remote Headworks Improvements	25,426	Oct 89	Restored headworks capacity
D.I. Sedimentation Tank System Improvements	19,626	Jul 89	Restored operating efficiency of the tank system
Residuals Management - Walpole Landfill	15,025	Sep 93	Developed a minor residuals landfill plan
Nut Island Immediate Upgrade	9,557	Dec 86	Upgraded and replaced obsolete equipment
D.I. Intermediate Upgrade	9,526	Jun 92	Upgraded the D.I Treatment Plant Facilities
Wastewater Metering	7,324	Dec 93	Provides accurate flow data
D.I. Digester Rehabilitation	7,354	Oct 86	Restored operating efficiency of the digesters
Commercial Point CSO Facility	7,140	Feb 91	Improved Water Quality
Millbrook Valley Interceptor Relief Sewer	6,176	Mar 88	Increased flow capacity to eliminate surcharges
Reading Pump Station Replacement and Extension Relief Sewer	5,436	Sep 87	Eliminated surcharges, reduced staff requirement, and corrected safety hazards
Interim Scum Management	4,203	Jul 89	Provided an interim scum processing solution

Project	Total Cost (\$000)	Completion Date	Accomplishment
Fox Point CSO Facility	4,164	Apr 89	Eliminated sewage discharges
Hingham Pump Station	3,014	Apr 92	Eliminated sewage discharges
D.I. Dual Fuel Engine/Generator	2,989	Dec 89	Ensured uninterrupted electricity supply
Southern System Modeling	2,607	Jun 88	Provided flow data for system capacity assessment
D.I. Island Chlorination Facility Rehabilitation	2,474	Mar 89	Ensured effective disinfection operation & a safe working environment
D.I. Electrical Equipment Upgrade	2,382	Mar 88	Restored the operating efficiency of the system
D.I. Sludge Thickeners Rebuilding	1,882	Sep 88	Ensured efficient operation of the D.I. Treatment Plant digesters
Bell Isle Siphon Rehabilitation	1,882	Apr 89	Reduced salt water infiltration and increased system capacity
Sewerage Division Management Services	1,861	Dec 86	Provided engineering design and construction advice
Somerville Marginal CSO Rehabilitation	1,697	Feb 89	Eliminated inadequately treated sewage discharges
Harbor Environmental Studies	1,753	Jun 92	Studied water quality of the harbor
Nut Island Intermediate Upgrade	1,254	Dec 92	Ensured effective operation of the Nut Island Treatment Plant
Comprehensive Safety Action Project	1,279	Nov 90	Corrected safety hazards at the facilities and established ongoing safety management program
Constitution Beach CSO Facility	1,265	Sep 87	Eliminated untreated sewage discharges into Boston Harbor
Shade's Siphons	765	Sept 88	Eliminated seawater inflows and sewage overflows
D.I. Operation & Construction Coordination Program	733	Jan 89	Provided coordination services for operations and construction activities
Cottage Farm & Charlestown Pump Repair	452	Dec 87	Restored system operation to its full capacity
D.I. Odor Monitoring	334	Feb 89	Provided data for the odor management plan
Watertown Siphon Reconstruction	328	May 88	Extended the useful life of Watertown's sewer system

Project	Total Cost (\$000)	Completion Date	Accomplishment
D.I. Sludge Grinding	291	Jun 87	Improved the grinding system
Southwest Corridor CSO	290	Fall 86	Eliminated combined sewage overflows
Moon Island CSO Facility	290	Sep 86	Examined options for CSO treatment
D.I. Microwave Equipment Replacement	235	Nov 86	Replaced obsolete equipment
Porter Street Construction	136	Sep 93	Reimbursement to Central Artery project for CSO related construction
Industrial Discharge Limitations	215	Aug 86	Developed industrial discharge limitation guidelines
Cottage Farm CSO Ventilation System Repair	133	Sep 94	Rehabilitation of the HVAC duct work to provide a safe and habitable facility for MWRA staff.
Bremen St Siphon Replacement	102	Mar 90	Evaluated siphon condition
Chelsea CSO Facility	90	Jan 91	Eliminated sewage overflow
Boston Gatehouses	65	Dec 86	Identified alternatives to minimize construction impacts
Industrial Waste-Technical Support	63	Oct 86	Provided laboratory services for the Toxics Reduction and Control Department
St. Mary's Street CSO Modifications	17	Feb 87	Identified solution for stormwater detention
TOTAL WASTEWATER	\$404,475		

WATERWORKS PROJECTS

Project	Total Cost (\$000)	Completion Date	Accomplishment
Northern Intermediate High Pipelines	11,419	Nov 88	Increased pipe capacity & pressure
Domestic Device Retrofit	10,332	Dec 93	Installed water saving devices
Transmission Maintenance Facility	4,866	Jun 93	New maintenance & operation facility
Long-Range Water Supply	5,579	Apr 89	Identified water supply programs

Project	Total Cost (\$000)	Completion Date	Accomplishment
Hultman - Weston Aqueduct Transfer for Hydropower	4,515	May 89	Produces approximately 3,700,000 kw hours/yr of electricity
Weston Reservoir Chlorination Facility	2,558	Jun 93	Replaced obsolete equipment
Leak Detection Survey	1,970	Aug 90	Provided data on the magnitude and location of water leaks
Northern Low Service - Sec 57	1,814	Oct 87	Restored pipe capacity and pressure
Norumbega Chlorination Facility	1,482	Mar 89	Provided a new disinfection facility for the water supply
Water Distribution Master Plan	1,177	Mar 93	Provided database and recommendations for master plan
Northern Immediate High Service	926	Aug 92	Increased water treatment capacity
Oakdale Power Station Generator Repair	945	Sep 91	Repaired substation metering and transformer systems
Reservoir Risk Assessment	647	Jun 92	Developed maps and data to determine at risk areas
Asbestos Abatement	571	Aug 90	Eliminated asbestos fibers in the facilities
Sudbury Reservoir Trt Plant Study and EIR	513	Sep 92	Evaluated alternatives uses of the Sudbury Reservoir
PCB Abatement	432	Aug 91	Replaced equipment with unacceptable levels of PCB concentrations
Cosgrove Intake Screens	317	Dec 87	Prevented debris from entering the aqueduct
Cosgrove Intake Turbine Repair	225	Jul 86	Allowed full resumption of generation of hydroelectric power
Municipal Toilet Replacement	128	Dec 87	Reduced water consumption
Air Release Valves	82	Apr 90	Removed excess air to maintain the carrying capacity of pipes
General Edwards Bridge Pipe Replacement	74	Nov 89	Repaired leaks of the pipe
Northern Extra High Srvs - Bedford Pipeline	71	Jan 92	Developed a plan to supply water to Bedford
Chestnut Hill Low Srvs Pumping Station	72	May 88	Repaired the front granite steps of the station

Project	Total Cost (\$000)	Completion Date	Accomplishment
Dudley Rd. Pump Station	53	Jun 91	Evaluated the feasibility of pump station rehabilitation
Ward St. Pump Station	33	Aug 89	Evaluated the feasibility of pump station rehabilitation
Blue Hills Reservoir Cover - Quincy	31	Dec 86	Identified solutions to a seagull contamination problem
Instrumentation Telemetry	24	Sep 86	Developed a future operation plan of the distribution system
Wachusett Reservoir By-pass Tunnel	15	Jan 89	Evaluated the option of constructing a tunnel bypass
Local Source of Supply	2,098	Jul 95	Promoted effective protection of existing local supply sources.
Water Meter Modernization	12,947	Sep 94	Improved the systems's revenue meters which measure flows delivered to customer communities.
TOTAL WATERWORKS	\$65,916		

ADMINISTRATION PROJECTS

Project	Total Cost (\$000)	Completion Date	Accomplishment
Management Information System	24,325	Dec 92	Enhanced the professional management of MWRA affairs
Charlestown Headquarters	7,413	Jun 91	Improved office equipment at MWRA headquarters
Radio Communications System	1,000	Sep 89	Enhanced communication among geographically dispersed facilities & mobile work crews
MWRA Mitigation Program	475	Oct 88	Reduced construction impacts of the D.I. improvements in Winthrop
Vehicle Maintenance Garage	412	Mar 89	Improved management & maintenance control of the vehicle fleet
Affirmative Action Study	403	Mar 91	Evaluated minority participation in the MWRA procurement process

Engineering Feasibility Study	249	Jun 89	Evaluated the integrity of the water and wastewater systems
Permanent Headquarters	161	Jan 87	Examined options for possible relocation of permanent office space
TOTAL ADMINISTRATION	\$34,438		

BOSTON HARBOR PROJECT COMPLETED CONSTRUCTION CONTRACTS

DI Primary & Secondary Treatment Facilities

<i>CP #</i>	<i>CONTRACT NAME</i>	<i>COMP. DATE</i>	<i>CONTRACT VALUE (000's)</i>	<i>ACCOMPLISHMENT</i>
020	Asbestos Removal Fort Dawes-Steam Pumping Station	Jan - 90	\$518	Removal and disposal of asbestos in buildings for demolition.
021	Demolition Fort Dawes Bunkers	Apr - 90	\$4,617	Removal and disposal of hazardous materials in bunkers for demolition.
022	Earthwork/Landfill/Roadways	Nov - 91	\$17,107	Built platforms for treatment plant and landforms to shield Winthrop from the plant.
023	Pumping Station Modifications and Sewers	Nov - 90	\$5,713	Modifications to protect outfall conduit from excessive load damage
024	Administration/Laboratory; Maintenance/ Warehouse Buildings	Dec - 94	\$48,921	Construction of a building to support DI Staff including Process Control, TRAC, Harbor Studies, Combined Sewer Overflow, Infiltration/Inflow, & NPDES.
027	Maintenance Shops Facility I	Apr - 92	\$395	Temporary storage facility and vehicle maintenance facility
028	Maintenance Shops Facility II	Sep - 92	\$1,970	
030	Disposal of Excess Till	Dec - 91	\$14,137	Excavation and off-island disposal of 1.1 million cubic yards of drumlin material.
040	DI Prison Demolition/Late Drumlin Excavation	Jun - 94	\$16,758	Demolition of prison to clear location for Secondary Clarifier Batteries A and B.
049	Hazardous Material Remediation (1991-1994)	Jun - 94	\$7,433	Investigation and remediation of existing hazardous material on Deer Island.
050	Hazardous Material II (1994-1996)	Apr - 96	\$1,660	

CP #	CONTRACT NAME	COMP. DATE	CONTRACT VALUE (000's)	ACCOMPLISHMENT
	<i>Nut Island Headworks Equipment</i>	<i>Mar - 92</i>	<i>\$347</i>	<i>Purchase of a diesel generator to Provide back-up power supply to existing plant and permanent supply to new plant.</i>
<i>101</i>	<i>North System Tunnel</i>	<i>Jul - 92</i>	<i>\$20,622</i>	<i>Construction of two 11.5 ft diameter tunnels to carry North Collection System Flows from the North Main Pump Station and the Winthrop Terminal Facility to the new North System Headworks facility.</i>
<i>103</i>	<i>North System Headworks</i>	<i>Dec - 94</i>	<i>\$96,096</i>	<i>Construction of a grit removal facility, a primary pretreatment gallery, a primary treatment control building, and two older control facilities.</i>
<i>105</i>	<i>Primary Clarifier Batteries A & B</i>	<i>Dec - 94</i>	<i>\$100,570</i>	<i>Construction of two batteries for primary treatment, each with 12 stacked clarifiers.</i>
<i>130</i>	<i>Primary Clarifier Batteries C & D</i>	<i>Jul - 95</i>	<i>\$84,379</i>	<i>Construction of the two remaining batteries (C and D) for primary treatment, each with 12 stacked clarifiers.</i>
<i>201</i>	<i>Permanent Pilot Plant</i>	<i>Sept - 94</i>	<i>\$11,942</i>	<i>Pilot testing program to refine the design of Deer Island facilities which includes the operation of a trailer-mounted oxygen activated sludge treatment unit, hydraulic model testing of stacked clarifier configurations, full-scale primary & secondary oxygen-activated sludge pilot facility with stacked clarifiers.</i>
<i>205</i>	<i>Deer Island Water Storage Tank</i>	<i>Oct - 94</i>	<i>\$9,061</i>	<i>Construction of a two million gallon water tank on northeast corner of Deer Island that connects to the Winthrop water main to supply the plant-wide water distribution system.</i>
<i>283</i>	<i>Effluent Outfall Diffusers</i>	<i>Nov - 92</i>	<i>\$77,088</i>	<i>Purchase and installation of riser and diffuser shafts and drilling of riser shafts.</i>
<i>285</i>	<i>Tunnel Muck Processing and Disposal</i>	<i>Nov - 94</i>	<i>\$14,449</i>	<i>First phase to process muck from Effluent Outfall tunnel for reuse as backfill and other purposes.</i>

CP #	CONTRACT NAME	COMP. DATE	CONTRACT VALUE (000's)	ACCOMPLISHMENT
301	Residual Treatment Facilities Phase I Primary Batteries A, B, C, & D	Dec - 95	\$213,717	Construction of a gravity thickener complex and associated facilities to thicken primary sludge.
401	Off-Island Water Line	Nov - 95	\$16,174	Construction of a three-mile water supply line through Winthrop to Deer Island.
427/ 402	Main 13.8kv Switchgear Building and Distribution System/Yard Utilities	Jan - 95	\$21,245	Provision of main switchgear equipment and construction of the main switchgear building.
	Interim Transformer Switchgear	May - 90	\$216	Power supply for construction and backup power source for the existing treatment plant.
431	BECO	May - 95	\$34,365	Provision of combustion turbine generators to meet back-up electric power needs on D.I.
	Construction Water	Jan - 95	\$1,997	Provision of water needed on D.I.
805	Interim Sludge Transfer Facility	Sep - 91	\$4,514	Built facility to store digested sludge from the existing plant and pump the sludge to barges for transport and processing at FRSA.
901	Construction Support Building	Jul - 91	\$4,067	Construction of building by pier that provides a waiting area, medical facilities, and work area for CM staff.
902	Construction Utilities, Roads, etc.	Jan - 92	\$5,153	Development of a temporary water system; Installation of an electrical distribution system; Construction of temporary roadways; Provision of temporary toilets, wheel wash station, trash handling facility and utility buildings.
903	Fuel Facility	Sep - 91	\$1,665	Construction of fuel tanks, pipeline, and dispensing facilities for daily fuel for Deer Island equipment and machinery.
904	Fuel Supplier 1 (1990-1992)	May - 92	\$126	Provision of fuel for construction equipment and vehicles on Deer Island from an interim fuel facility.

CP #	CONTRACT NAME	COMP. DATE	CONTRACT VALUE (000's)	ACCOMPLISHMENT
909	Security I (1988-1990)	Oct - 90	\$198	Development of a centralized security system including equipment and supplies.
917	Security II (1990-1992)	Dec - 92	\$1,196	
930	Security III (1992-1994)	Dec - 94	\$1,233	
910	Site and Fore River Staging Area Maintenance I	Nov - 92	\$1,898	Provision of long term maintenance of construction roadways and sanitary facilities on Deer Island.
931	Site and Fore River Staging Area Maintenance II	Nov - 94	\$2,476	
911	Trash Handling and Disposal I (1990-1993)	Jul - 93	\$852	Collection and disposal of solid waste for all contractors at an approved site.
933	Trash Handling and Disposal II (1993-1995)	Jun - 95	\$954	
912	Off-Site Maintenance and CSB Housekeeping I	Jan - 93	\$205	Provision of initial janitorial services, general clean-up and landscape maintenance for off-site facilities that support construction at Deer Island.
934	Off-Site Maintenance and CSB Housekeeping II	Feb - 95	\$315	
913	Rodent Control (1989-1991)	Jul - 91	\$34	Performance of a comprehensive rodent control program on Deer Island.
919	Rodent Control II (1991-1995)	Sep - 95	\$133	
922	Off-Site Snow Related Services	Nov - 92	\$134	Provision of road/parking lot snow service and asphalt sweeping for off-site facilities that support construction at Deer Island and Nut Island.
932	Off-Site Snow Related Services/Asphalt Sweeping II	Dec - 94	\$589	
950	Construction Support Labor I (1991-1992)	Aug - 92	\$735	Provision of construction, reconstruction, renovation, reconditioning, installation, repair, and testing of construction support facilities and systems.
951	Construction Support Labor II (1992-1993)	Jul - 93	\$3,992	
952	Construction Support Labor III	Jul - 95	\$5,855	
960	Construction Support Labor - Electrical (1993-1995)	Jun - 95	\$909	Provision of electrical installation, repair, and testing of construction support facilities and systems.

<i>CP #</i>	<i>CONTRACT NAME</i>	<i>COMP. DATE</i>	<i>CONTRACT VALUE (000's)</i>	<i>ACCOMPLISHMENT</i>
962	Construction Support Labor - HVAC	Apr - 96	\$429	Provision of HVAC work required due to construction on Deer Island.

Water Transportation

CP#	CONTRACT NAME	COMP. DATE	CONTRACT VALUE (000's)	ACCOMPLISHMENT
001	Marine Facilities at Deer Island	Feb - 90	\$27,694	Construction of roll on/roll off piers, bulk cargo piers, and a personnel transport pier.
002	On-Shore Marine Facility Quincy	Apr - 90	\$6,966	Construction of roll on/roll off piers at FRSA with two 110 foot transfer bridges.
005	Squantum Point Pier (Dredging)	Feb - 90	\$417	Completion of the dredging of channel necessary at Squantum Point Pier in Quincy.
007	Bus Terminal and Parking Facility at Suffolk Downs	May - 91	\$341	Improvements to the land transport system at the Suffolk Downs site in order to facilitate bus operations.
009	Charlestown Demolition, Rehabilitation, and Ferry Terminal	Aug - 92	\$2,443	Lease and rehabilitation of site including demolition of on-site buildings, and subsequent additions including parking, drainage, and safety improvements.
	Asbestos-Revere Sugar	Dec - 91	\$483	Lease and removal of asbestos of Revere Sugar Facility.
	Revere Sugar Lease	Oct - 94	\$2,234	
010	Asbestos and Electric Cable Removal FRSA	Jul - 90	\$423	Removal of asbestos in buildings for modification and rehabilitation at FRSA.
011	Demolition at FRSA	Aug - 90	\$240	Demolition of approximately 20 buildings and upgrade of an additional 17 for construction of storage area.
012	Marine and On-Shore Facilities FRSA	Jul - 92	\$5,770	Construction of on-shore storage and lay down area to facilitate the transportation of materials and equipment to Deer Island.
013	Squantum Point Pier (Marine Construction)	Jul - 90	\$1,642	Construction of marine facilities at Squantum Point Pier in Quincy.
014	Upland Facility/Personnel Ferry Terminal Squantum	May - 91	\$1,960	Construction of a facility to support ferry service to transport workers from Squantum Point in Quincy including a pier, gangway, and floats.

<i>CP#</i>	<i>CONTRACT NAME</i>	<i>COMP. DATE</i>	<i>CONTRACT VALUE (000's)</i>	<i>ACCOMPLISHMENT</i>
<i>015</i>	<i>Nut Island Dredging</i>	<i>Feb -91</i>	<i>\$217</i>	<i>Completion of dredging to allow enough space for barges to transport sludge from Nut Island to Fore River Pelletization Facility until the Nut Island Treatment Plant is decommissioned.</i>
<i>016</i>	<i>Squantum Point Intersection Improvements</i>	<i>Jun - 94</i>	<i>\$1,049</i>	<i>Improvements to intersections at Squantum Point to minimize the impact of increased traffic.</i>
<i>150</i>	<i>Marine Facility at Nut Island</i>	<i>Mar - 90</i>	<i>\$5,393</i>	<i>Provision of materials loading and off-loading for barges arriving from Fore River.</i>
<i>941</i>	<i>Revere Sugar Facility Support</i>	<i>Oct - 94</i>	<i>\$0</i>	<i>Provision of overhead and labor to support personnel ferry operations at the Revere Sugar Personnel Ferry Terminal in Charlestown.</i>

SOURCE OF FUNDS

State Construction Grant Fund	Federal Construction Grant Fund	Special Federal Grants	State Revolving Loan Fund	Other	Bonds/Cash Financing	TOTAL
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WASTEWATER

Quincy Pump Facilities	48	240	\$1,979		\$21,363	\$23,342
Braintree-Weymouth Relief	887		24,911		148,047	148,335
New Neponset Valley Relief					5,852	31,650
Upper Neponset Valley Relief					2,998	2,998
Wellesley Extension Sewer	30,115	18,955			23,035	72,105
Framingham Extension Sewer	1,142		19,000		31,897	52,039
Cummingsville Branch Sewer					4,196	4,196
Alewife Brook Pump					1,487	1,487
North Metropolitan Trunk Sewer			7,500		12,695	20,195
Siphon & Chamber Structures					671	671
Wastewater Metering					500	500
Ashland Extension Sewer					1,000	1,000
System Master Plan Interceptors					18,409	18,409
Corrosion and Odor Control Study					702	702
Facilities Rehabilitation					752	752
Remote Headworks Rehabilitation					3,526	3,526
BHP Performance Certification					1,500	1,500
DITP Outfall Repair					1,309	1,309
Deer Island Primary & Secondary	9,657		305,046		2,124,818	3,009,057
Water Transportation Facilities	30,234		5,054	17,049	194,903	247,240
Residuals	354		3,289		49,884	53,527
CSOs	1,122		1,370		378,526	381,018
Infiltration/Inflow Local Assist.					15,937	15,937

WATERWORKS

Drinking Water Quality Improvements (Wachusett)					\$506,238	\$506,238
Drinking Water Quality Improvements (Quabbin)					16,432	16,432
Watershed Protection					8,592	8,592
MetroWest Tunnel					637,025	637,025
Dam Control Valve Replacement					1,829	1,829
Sluice Gate Rehabilitation					5,931	5,931
Northern Tunnel Loop					214	214
Echo Bridge Rehabilitation					357	357
Chicopee Valley Aqueduct Interconnections					4,216	4,216
Valve Replacement					12,082	12,082
Cathodic Protection of Distribution Mains					214	214
Boston Low Service Pipe/Valve					24,056	24,056
Weston Aqueduct Supply Rehab 1 & 2					35,728	35,728
Nonantum Rd. Pipe Replacement					2,026	2,026
Warren Cottage Line Rehab					1,485	1,485
Southern Service Improvements					12,623	12,623
Heath Hill Road Pipe Replacement					14,279	14,279
Southern Spine Distribution Mains					35,861	35,861
Blue Hills Covered Storage					21,540	21,540
Southern Extra High-Sees 41, 42, & 74					2,746	2,746
Chestnut Hill Connecting Mains					3,761	3,761

SOURCE OF FUNDS

	State Construction Grant Fund	Federal Construction Grant Fund	Special Federal Grants	State Revolving Loan Fund	Other	Bonds/Cash Financing	TOTAL
Newton Service Improvements						7,455	7,455
Comm Avenue Pump Modernization						7,393	7,393
Lexington St. Pump Station Rehab						3,170	3,170
Rehabilitation of Other Pump Stations						8,646	8,646
Bear Hill Improvements - Section 29						1,367	1,367
Bear Hill Covered Storage						5,356	5,356
Spot Pond Pump Station Rehab						49,164	49,164
Weston Aqueduct and Supply Main 4						41,329	41,329
Spot Pond Supply Mains - Rehab						42,758	42,758
Northern Low Serv. Pipeline Replac.						1,710	1,710
Water Main Reloc-Chels Rvr Easmt						1,097	1,097
Northern Low Service-Secs 8 & 57						10,515	10,515
New Connecting Mains-Shaft 7 to WASM 3						59,860	59,860
Northern High Serv.-Sec 26 Replace.						5,056	5,056
Northern High Serv.-Sec 91						6,216	6,216
Northern High Serv.-Lynn Pipeline						14,065	14,065
Northern High Serv.-Sec 27 Improv.						2,775	2,775
Northern High Serv.-Revere/Malden						29,126	29,126
Northern High Serv.-Pipeline Rehab						13,861	13,861
Northern Extra High Service New Pipelines						3,255	3,255
Hydraulic Model Update						300	300
Centr. Monitoring System Expansion						12,515	12,515
Rehabilitation of Existing Facilities						9,083	9,083
Distribution Systems Facs. Mapping						748	748
Local Water Infrastructure Rehab.						0	0
ADMINISTRATION							
North Maintenance Facilities						\$18,058	\$18,058
Fore River Staging Area						9,268	9,268
Technical Assistance Contracts						5,138	5,138
Business System Plan						4,677	4,677
TOTAL	\$73,559	\$19,195	\$579,249	\$375,485	\$0	\$4,765,203	\$5,812,691

APPENDIX C

EXPECTED USEFUL LIFE OF CAPITAL PROJECTS

The estimated useful lives of the MWRA's capital projects are summarized below:

Type of Capital Improvement	Estimated Useful Life (in years)
Study	5
Equipment	15
Cathodic Protection	15
Stop Planks	40
Control Valves	40
Pipeline	40
Relief Sewer	40
Pump Station	40
Sewerage Treatment Facilities	40
Water Treatment Facilities	50
Covered Storage Facilities	50
Tunnels	100

APPENDIX D

CAPITAL IMPROVEMENT PROGRAM DEVELOPMENT

Schedule and Process

The MWRA is required to produce periodic revisions to its Capital Improvement Program (CIP) Budget. Development of the budget occurs in two cycles, first in proposed form, second in final form.

The first cycle entails review of existing capital projects and consideration of new project proposals. The cycle lasts from July to December and results in the proposed capital budget. The cycle lasts from July to December and results in a proposed capital budget. The MWRA is then directed by the Board of Directors to transmit the budget to the Advisory Board for a 60-day comprehensive review of the document. At the end of the review process, the Advisory Board submits formal comments and recommendations to the MWRA. During the month of April, a special committee of the Board of Directors holds a hearing on the proposed budget. Shortly thereafter, the full Board of Directors votes on the budget and indicates any further changes.

The second cycle, preparation of the final budget, begins in April. Upon completion of the Board of Directors review, the divisions update project schedules, budgets, and cashflows for any new information which has become available since the previous Fall. The final document is prepared and submitted to the Board of Directors for final approval at the end of June. Upon approval, the budget becomes effective July 1st and remains in effect for one year.

A detailed listing of activities can be found in the following pages.

Developing the Capital Budget - Calendar of Activities

<u>Month</u>	<u>Task</u>
June	Rates and Budget Department distributes budget forms, instructions, and diskettes to divisions.
July	Divisions submit new project ideas. Executive Director, Rates and Budget Department, and Divisions meet to discuss projects.
August	Divisions return CIP packages to the Rates and Budget Department.
September	Rates and Budget Department meets with division staff to resolve issues on new and expanded projects.

	Rates and Budget Department develops comments and/or recommendations on projects.
October	<p>Executive Director reviews the projects and makes decisions.</p> <p>Executive Director and Division Directors prioritize new project proposals.</p> <p>Rates and Budget Department (CIP & CEB) reviews updated Current Expense Budget impact sections.</p> <p>Rates and Budget Department and divisions finalize cash flows and schedules.</p>
November	<p>Revenue, grant, and debt service estimates are prepared.</p> <p>Rates and Budget Department prepares proposed budget document.</p> <p>Divisions review the proposed budget document.</p> <p>Executive Director reviews the proposed budget document.</p>
December	Rates and Budget Department submits proposed budget document to the Board of Directors for official transmittal to the Advisory Board.
January - February	<p>Advisory Board reviews proposed budget.</p> <p>Rates and Budget Department staff, with assistance from divisions, respond to the Advisory Board's questions about proposed budget.</p>
March	<p>Advisory Board submits comments and recommendations to the MWRA.</p> <p>Rates and Budget Department reviews the Advisory Board's recommendations with divisions to develop the MWRA's response and to discuss possible budget changes.</p> <p>Rates and Budget Department distributes forms, instructions, and diskettes to divisions for CIP update.</p>
April-May	<p>Board of Directors conduct hearings on proposed budget.</p> <p>Rates and Budget Department, with assistance from Divisions, develops MWRA's final response to the Advisory Board's recommendations.</p>

Divisions incorporate final recommendations into CIP update.

Divisions return completed forms and diskettes for the CIP update.

June

Board of Directors review and approve MWRA's formal response to the Advisory Board's recommendations on proposed budget.

MWRA distributes official response to the Advisory Board's comments and recommendations.

Board of Directors review and approve final budget document.

B. Proposed CIP Preparation

Each division is required to submit proposals for each existing capital project, new capital projects, and equipment requests to be considered for inclusion in the proposed Capital Improvement Program. Proposals for new capital projects are considered once a year during the preparation of the proposed CIP. The only exception to this rule is acceptance of a new project proposal that requires a commitment of resources during that fiscal year.

There are four major goals to be met to ensure that the budget document is accurate. The first goal involves writing a narrative section which describes and justifies the project and articulates the public benefit derived from the proposed capital investment. In general, this goal has been met for existing projects. However, the project descriptions must be continually updated to include any changes in project scope.

The second goal consists of a continuing effort to improve project schedules. Project planning involves developing data on individual milestones and tasks required to carry out each project phase, and should also identify the staff resources necessary to carry out each task. Detailed project planning will not only be used to establish project schedules, but will also permit quarterly variance reporting of actual performance in comparison to planned progress for each capital project.

The third goal is to develop accurate cost estimates in current dollars for all phases with particular attention given to large construction phases. New cost estimates should be obtained from the consultant at regular intervals during the design process. These estimates will be incorporated into the budget document. In order to ensure the accuracy of in-house and consultant cost projections, detailed cost estimates should be supplied to the Rates and Budget Department in support of the budget amount.

The fourth goal involves the continuing effort to improve the accuracy of capital expenditure projections. Every effort should be made to project the probable sequence of construction tasks, and make allowances for winter construction. In addition, project managers should request the

contractor's cashflow and use this in drafting the expenditure projections for awarded contracts.

The CIP update process also has secondary goals which include comprehensive identification of all phases of a capital project that will result in a contract, greater accuracy in the estimation of operations and maintenance costs for new capital facilities, and greater precision in predicting grant revenue.

CAPITAL BUDGETING POLICIES AND PROCEDURES

These policies and procedures govern capital budgeting and management practices at the Massachusetts Water Resources Authority. Deviations from policy, if any, will be reported to the MWRA's Board of Directors. Policies and procedures may be amended from time to time, provided that changes in provisions governing reporting to or approvals by the Board of Directors or the Advisory Board must be approved by the Board of Directors.

CAPITALIZATION POLICY

It is the policy of the MWRA that capitalization of expenditures be in conformance with generally accepted accounting principles. Under such guidelines, the MWRA has adopted the provision of the Financial Accounting Standards Board's Statement No. 71, "Accounting for the Effects of Certain Types of Regulation," to provide a better matching of revenues and expenses. Capital expenditures are intended to create assets or extend their useful lives. Assets are valued at their cost and provide benefits over an extended period of time. Sources of funds for capital expenditures include grants and loans, proceeds of Authority borrowing, and current revenue.

Asset value created by the Authority is of two kinds. One is the value of tangible assets either created or increased through Authority capital investments. Such assets include land, buildings, plant, equipment, and the system infrastructure for water and wastewater. The cost of such fixed asset investment includes not only purchase, rehabilitation, or construction cost, but also ancillary expenses necessary to make productive use of the asset. Ancillary costs can include, but are not limited to, costs for planning studies, professional fees, transportation charges, site preparation expenditures, and legal fees and claims directly attributable to the asset.

The second kind of asset value created by Authority investment is the value of intangible assets. While such investment does not result in tangible Authority assets, it does create a benefit to the Authority and its users over several years. Such assets include the cost of Authority efforts to establish base-line leak detection information for the water systems of MWRA customers. The cost of providing water consumption-limiting devices to households is another example.

Expenditures for tangible assets are included in the Capital Improvement Program and Budget if the expected cost of the individual asset or capital project is \$100,000 or more and if the expected useful life is more than one year. Expenditures for intangible assets are capitalized if the expected benefit

period is three years or more. Annually recurring costs and expenditures for maintenance of assets are not capitalized, even though their cost may exceed \$100,000. Such recurring and maintenance costs include replacement of vehicles and computers, replacement of valves, and repair of interceptors and pipelines.

Renewal and Replacement Reserve

The renewal and replacement reserve has been established to fund a required capital improvement which is not provided for by monies otherwise available. Amounts may not be withdrawn until the MWRA has specified the project to which the amount will be applied and its estimated cost and estimated completion date. It must also certify that such expenditure is reasonably required for the continued operation of the systems or for maintenance of revenues and that other provisions have not been made for funding such expenditures. Every three years, the MWRA will receive recommendations from a consulting engineer as to the adequacy of the renewal and replacement reserve fund requirement.

CAPITAL BUDGET MANAGEMENT POLICIES AND PROCEDURES

Capital Budget Contingency

A contingency for each fiscal year is incorporated into the Capital Improvement Program for the purpose of providing funds for unanticipated or unpredictable costs associated with capital projects. Transfers from the contingency budget to the budget for a capital project phase can be made at any time during the fiscal year. Such transfers will occur automatically when the Executive Director authorizes either a contract award amount higher than the budgeted figure for the project phase, or change orders/contract amendments that result in costs higher than budgeted expenditures. If the contingency for the fiscal year has been exhausted, a budget amendment authorized by the Board of Directors is required to replenish it. A report on current and cumulative transfers from the contingency budget will be prepared monthly by the Rates and Budget Department.

Capital Budget Amendment

From time to time, it may be necessary to amend the Capital Expenditure Budget. Amendments are required when an unbudgeted capital project is proposed; a capital project budget, including all contingency transfers, has been exhausted by contract awards; or the contingency is to be replenished. In such cases, the Executive Director may recommend to the Board of Directors a budget amendment which can include new or higher amounts for individual projects or an additional contingency amount. The amendment will be submitted to the MWRA Advisory Board for review and comment for a period of 30 days. At the end of the 30 day period, the Board of Directors may take action on the budget amendment.

Capital Budget Monitoring and Reporting

The progress of capital projects is continually monitored for purposes of managerial control and decision-making and for financial planning and management. Each division is responsible for monitoring and reporting on the projects for which it is responsible, including explanations for both schedule and expenditure variances. Monitoring of revenue variances is a joint responsibility of grants management and budget staff. Monthly expenditure reports are distributed to divisions by the Rates and Budget Department.

Reports to the Executive Director on capital budget performance will be made quarterly. Two capital budget variance analysis reports will be provided to the Board of Directors, one for the first six months of a year and one at year end. The reports will include planned project schedules, revenues, and expenditures compared to actual performance. A schedule variance occurs when actual project schedules are three or more months behind or ahead of the planned timetable.

APPENDIX E
PRIORITIZATION OF CAPITAL PROJECTS
(\$000)

CIP #		<u>TOTAL CONTRACT</u>	<u>PREVIOUS PAYMENTS</u>	<u>REMAINING BALANCE 6/30/96</u>
PRIORITY ONE PROJECTS				
1101	Quiney Pump Facilities (Squantum Force Main Ph 1&2	\$6,677	\$2,095	\$4,582
1102	DI Treatment Plant Outfall Repair	1,309	1,309	0
1103	MetroWest Tunnel	637,025	26,613	610,412
2323	Spot Pond Pump Station Rehabilitation (Suction / Dist. Pipe & Pump Station)	<u>32,419</u>	<u>10,799</u>	<u>21,620</u>
	Total Priority One	\$677,430	\$40,816	\$636,614
PRIORITY TWO PROJECTS				
1202	Boston Harbor Project Performance Certification	\$1,500	\$50	\$1,450
1204	DI Primary and Secondary Treatment Facilities	3,009,057	2,418,871	590,186
1205	Water Transportation Facilities	247,240	214,206	33,034
1301	Residuals Management Facilities	53,527	10,445	43,082
1401	Combined Sewer Overflow (Planning) Program	36,265	27,273	8,992
2335	Northern High Service Pipe Impmt - Revere/Malden	<u>29,126</u>	<u>24,180</u>	<u>4,946</u>
	Total Priority Two	\$3,376,715	\$2,695,025	\$681,690
PRIORITY THREE PROJECTS				
1101	Quiney Pump Facilities (Quiney Force Main)	\$1,774	\$0	\$1,774
1102	Braintree-Weymouth Relief Facilities	148,335	5,814	142,521
1103	New Neponset Valley Relief Sewer	31,650	30,379	1,271
1105	Wellesley Extension Sewer Replacement	72,105	64,143	7,962
1106	Framingham Extension Relief Sewer	52,039	11,997	40,042
1108	Alewife Brook Parkway Pump St. Rehab.	1,487	1,487	0
1109	N. Metro. Trunk Sewer Rehab. Phase II	20,195	25	20,170
1110	Siphon Chamber & Diversion Structure Rehab.	671	121	550
1111	Wastewater Metering System Upgrade	500	25	475
1112	Ashland Extension Sewer	1,000	0	1,000
1113	System Master Plan - Interception	18,409	0	18,409
1201	DI Remote Headworks Rehabilitation	3,526	656	2,870
2101	Safe Drinking Water Act Compliance Program	506,238	17,454	488,784
2102	Chicopee Valley Aqueduct System Improvements	16,432	1,109	15,323
2307	Nonantum Road Pipe Rehabilitation	2,026	557	1,469
2309	Warren Cottage Line Rehabilitation	1,485	0	1,485
2310	Southern Service Improvements (Newton St. Pump)	3,485	1,649	1,836
2314	Southern Extra High - Sections 41 and 42	2,746	0	2,746
2318	Comm. Ave. Pump Station Modernization	7,393	951	6,442
2319	Lexington St. Pump Station Rehabilitation	3,170	1,293	1,877
2323	Spot Pond Pump Station Rehabilitation (Fells Storage)	16,745	1,109	15,636
2326	Northern Low Service Pipeline Replacement	1,710	221	1,489
2327	Water Main Relocation in Chelsea River Easement	1,097	0	1,097
2331	Northern High Service - Section 26 Revere	5,056	0	5,056
2332	Northern High Service - Connecting Mains to Sec. 91	6,216	121	6,095
2333	Northern High Service - Pipe Impmts Lynn Pipeline	14,065	11,599	2,466
3101	North Maintenance Facilities	<u>18,058</u>	<u>516</u>	<u>17,542</u>
	Total Priority Three	\$957,613	\$151,226	\$806,387

CIP #		<u>TOTAL CONTRACT</u>	<u>PREVIOUS PAYMENTS</u>	<u>REMAINING BALANCE 6/30/95</u>
PRIORITY FOUR PROJECTS				
1101	Quiney Pump Facilities Study (Pump Stations)	\$14,891	\$2,160	\$12,731
1104	Upper Neponset Valley Relief Sewer	2,998	0	2,998
1107	Cummingsville Branch Sewer	4,196	605	3,591
1114	Corrosion & Odor Control Study	702	0	702
1115	Facilities Rehabilitation	752	0	752
1401	Combined Sewer Overflow Control Program (CSOs)	344,753	929	343,824
1501	Infiltration/Inflow Local Financial Assistance Program	15,937	22,519	(6,582)
2103	Local Sources of Supply	0	0	0
2104	Sudbury Reservoir	8,592	82	8,510
2202	Dam Control Valve Replacement	1,829	1,074	755
2203	Sluice Gate Rehabilitation	5,931	2,151	3,780
2204	Northern Tunnel Loop	214	0	214
2205	Echo Bridge Rehabilitation	357	357	0
2206	Chicopee Valley Aqueduct Interconnections	4,216	0	4,216
2302	Blow-off Valve Replacement	12,082	860	11,222
2303	Cathodic Protection of Distribution Mains	214	60	154
2305	Boston Low Service and Valve Rehabilitation	24,056	1,666	22,390
2306	WASM 1 and 2 Rehabilitation	35,728	0	35,728
2310	Southern Service Impts (except Newton St. Pump)	9,138	5,150	3,988
2311	Heath Hill Pipe Replacement	14,279	839	13,440
2312	Southern Spine Distribution Mains	35,861	0	35,861
2313	Blue Hills Covered Storage	21,540	0	21,540
2315	Chestnut Hill Connecting Mains	3,761	0	3,761
2317	Newton Service Improvements	7,455	15	7,440
2320	Rehab. Study of Other Pump Stations	8,646	401	8,245
2321	Bear Hill Improvements - Section 29 Rehab.	1,367	0	1,367
2322	Bear Hill Covered Storage	5,356	0	5,356
2324	WASM 4	41,329	1,813	39,516
2325	Spot Pond Supply Mains - Rehab. & Replacement	42,758	50	42,708
2328	Northern Low Service Rehab. Sections 8 and 57	10,515	0	10,515
2329	New Con. Mains - Shaft 7 to WASM 3	59,860	360	59,500
2334	Northern High Service Section 27	2,775	0	2,775
2336	Northern High Service Pipeline Rehabilitation	13,861	0	13,861
2337	Northern Extra High Service - New Pipelines	3,255	194	3,061
2338	Hydraulic Model Update	300	0	300
2401	Central Monitoring System Expansion	12,515	8,333	4,182
2402	Rehabilitation of Existing Facilities	9,083	2,155	6,928
2403	Distribution Systems Facility Mapping	748	128	620
3102	Fore River Preservation	9,268	8,239	1,029
3103	Technical Assistance Contracts	5,138	1,459	3,679
3104	Business Systems Plan	<u>4,677</u>	<u>1,498</u>	<u>3,179</u>
Total Priority Four		\$800,933	\$63,097	\$737,836
 TOTAL FOR ALL PROJECTS				
Final Payments		<u>159,550</u>	<u>158,908</u>	<u>642</u>
TOTAL		<u>\$5,972,241</u>	<u>\$3,109,072</u>	<u>\$2,863,169</u>

APPENDIX F

GLOSSARY OF TERMS

Activated Sludge - the sludge that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment.

Advanced Waste Treatment - wastewater treatment beyond the secondary or biological stage that includes the removal of nutrients such as phosphorus and nitrogen and the removal of a higher percentage of suspended solids and organic matter.

Aerobic - in the presence of oxygen.

Anaerobic - life or processes that require, or are not destroyed by, the absence of oxygen such as bacteria which digest sludge.

Ash - the inert material remaining after the combustion of wastewater sludge. It can be either wet or dry depending on combustion system design.

Bacteria - One-celled microscopic organisms commonly found in the soil that perform a variety of biological treatment processes.

Blow-off Valves - valves operated during pipeline repair to dewater and isolate a portion of the pipeline.

BOD (Biochemical Oxygen Demand) - an indicator of the amount of biodegradable contaminants in wastewater.

BWSC (Boston Water and Sewer Commission) - responsible for providing water and sewer services to the City of Boston.

CAC - Citizens Advisory Committee.

CADD - Computer Aided Drafting/Design

Capital Investment - development of a facility or other asset which adds to the long-term value of an organization.

Cathodic Protection - a form of corrosion protection which is particularly effective against galvanic corrosion. Galvanic corrosion occurs when pipe metal is in the presence of other metals while immersed in water. The interaction of these elements causes an electric current to flow away from the pipe, taking electrons with it and pitting the pipe as a result. Cathodic protection reverses the current thereby stopping the corrosion.

Centrifuge - machine that uses centrifugal force to separate substances of different densities and remove moisture.

CFM - (Cubic Feet per Minute) - a measure of the quantity of a liquid flowing through a pipe.

Clean Water Act of 1972 - passed by Congress to protect the water resources of the nation, promote cleanup efforts of polluted bodies of water, and encourage states to adopt water conservation measures. It also prohibits many environmentally unsound disposal methods that threaten to pollute the nation's water supplies.

Cleaning and Lining - cleaning and cement lining of unlined cast iron mains to improve hydraulic capacity and increase useful life.

Coliform Bacteria - bacteria used as indicators of pollution from human wastes.

Combustion - the process of burning wastewater treatment residuals to remove water and reduce the remaining residues to a safe, nonburnable ash.

Comminutor - a machine or process which pulverizes and reduces solids to minute particles.

Composting - the process of converting wastewater treatment residuals to a soil-like humus material often used in the horticultural industry. The process involves the aerobic breakdown of the residuals and the addition of sawdust or wood chips.

Cross-Connection - a point at which potable water piping is connected to a non-potable water source creating an opportunity for introduction of pollutants into the potable water.

Cryptosporidium - a disease-causing parasite commonly found in lakes and rivers, especially when the water is contaminated with sewage and animal wastes.

CSO (Combined Sewer Overflow) - combined sewers in the metropolitan Boston area collect both sewage and storm water runoff for wastewater treatment. During rainstorms, the system becomes overloaded and the excess is discharged directly into Boston Harbor from Combined Sewer Overflow pipes. There are approximately 88 CSOs that discharge into the harbor.

Current Expense Budget Impact - the affect a project will have, upon completion and activation, on the current expense budget of the MWRA.

C-Value - the carrying capacity of a water main for a specified length and pressure drop is determined by its diameter and resistance to flow. The friction coefficient "C" of the main is often used as a measure of flow resistance. C-values for new pipe are about 120 for mains 6- to 16-inches in diameter, and 130 and 140 for larger diameters.

DEP (Department of Environmental Protection) - the Massachusetts agency that regulates water pollution control, water supplies, and waterways and dispenses federal and state grant funds to support these activities.

Dewatering - the process of removing water from wastewater treatment residuals. Dewatered sludge has the appearance of a mud or wet soil material.

Diffusers - a system of shafts, rising from the end of the effluent outfall tunnel to the seabed, that will disperse treated wastewater over a large area.

DIFP (Deer Island Facilities Plan) - the MWRA's plan to construct new facilities on Deer Island and to provide secondary treatment of wastewater generated by the 43 communities in the MWRA sewer area.

Digesters - tanks for the storage and anaerobic or aerobic decomposition of organic matter present in sludge.

Disinfection - the killing of water born fecal and pathogenic bacteria and viruses in potable water supplies or wastewater effluents with chlorine, sodium hypochlorite, or similar compounds.

Dissolved Oxygen (DO) - a measure of the amount of oxygen in a given amount of water. Adequate levels of DO are needed to support aquatic life. Low dissolved oxygen concentrations can result from inadequate waste treatment.

Dual Host Computer - coupled computer system consisting of two computer processing units (CPUs), one CPU running the main system and the second CPU providing back-up protection as well as running low level activities.

Effluent - treated wastewater discharged from a treatment plant.

EIR (Environmental Impact Report) - State process to review environmental impact and ensure public review.

EIS (Environmental Impact Statement) - Federal review process.

ENF (Environmental Notification Form) - the first step in the EIR process.

EOEA (Executive Office of Environmental Affairs) - the Massachusetts cabinet office overseeing all state environment agencies.

EPA (Environmental Protection Agency) - the federal government agency responsible for environmental enforcement and investigation.

Eutrophication - nutrient enrichment of a lake or other water body, typically characterized by increased growth of planktonic algae and rooted plants. It can be accelerated by wastewater discharges and polluted runoff.

Flash coat - a light coat of shotcrete used to cover minor blemishes on a concrete surface.

Force Main - a pressure pipe joining the pump discharge at a water or wastewater pumping station with a point of gravity flow.

Graphitization - corrosion mechanism which alters the molecular structure of the carbon/iron matrix of cast iron pipe. During the process, iron atoms are forced away from the metal leaving behind an unstable carbon matrix. The result is a weakened pipe, easily susceptible to ruptures. High frequency in the number of breaks has caused leakage to be a major problem of graphitized pipe.

Grit - sand-like materials that quickly settle out of wastewater.

Groundwater - the body of water beneath the surface of the ground. It is made up primarily of water that has seeped down from the surface.

Head House - a structure containing the control gates to a conduit such as a sewer pipeline.

Headworks - a preliminary treatment device or structure, usually involving a screening and degritting operation, that removes large or heavy materials (such as logs and sand) from wastewater prior to primary treatment.

Heavy Metals - metals that can be precipitated by hydrogen sulfide in acid solution, for example, lead, silver, gold mercury, bismuth, and copper.

Incineration - see combustion.

Infiltration/Inflow - the means by which groundwater and surface water enters sewer pipes and results in treatment of unnecessarily large wastewater volumes. Infiltration is groundwater that leaks into the sewerage system through pipe joints and defects. Inflow is primarily a wet-weather phenomenon and refers to water that enters sanitary sewers from improperly connected catch basins, sump pumps, roof leaders, land and basement drains, and defective manholes and tidegates.

Influent - the flow of water that enters the wastewater treatment process.

Interceptors - the large pipes that convey wastewater from the collection system to the treatment plant.

Land Application - the use of wastewater treatment residuals on land for agricultural benefits.

Landfilling - the disposal of residuals by burial. Modern landfills have double liners, leachate collection systems, and other design features to protect against groundwater contamination.

Leachate - water that drains from a landfill after having been in contact with, and potentially contaminated by, buried residuals. Modern landfills are designed to collect leachate for subsequent treatment.

Limnology - the scientific study of physical, chemical, meteorological, and biological conditions in fresh waters.

Mapping Protocols - sets of specifications defining the content and format of data to be collected.

MDC (Metropolitan District Commission) - prior to 1985, the agency responsible for water and sewer services in metropolitan Boston, a responsibility the MWRA assumed in July 1985. The MDC continues to oversee and manage parks and recreational areas, roadways in the metropolitan area, and the Quabbin Reservoir.

MEPA (Massachusetts Environmental Policy Act) - the MEPA Unit is the state office that oversees the EIR process.

Methane - a colorless, nonpoisonous, flammable gas produced as a byproduct of anaerobic sludge processing.

MGD - Million Gallons per Day

Mitigation - includes: (a) avoiding the impact altogether by not taking a certain action, (b) minimizing impacts by limiting the magnitude of the action, (c) rectifying the impact by repairing, rehabilitating, or restoring the impacted area, (d) preventing an impact by preservation and maintenance operations, and (e) compensating for an impact by replacing or providing substitute resources or environments.

MWRA (Massachusetts Water Resources Authority) - an independent, regional authority responsible for providing sewer and wastewater treatment services to 43 communities in the metropolitan Boston area and water services for 45 communities in the region. Central objectives of the Authority include cleaning up Boston Harbor, constructing new wastewater treatment facilities, improving the existing infrastructure, supplying adequate amounts of pure water, and promoting water conservation.

NPDES (National Pollutant Discharge Elimination System) - a permit issued by EPA in conjunction with DEP to govern discharges into waterways.

Operation and Maintenance (O&M) - the organized procedure for causing a piece of equipment or a treatment plant to perform its intended function and for keeping the equipment or plant in such

condition that it is able continually and reliably to perform its intended function.

Organic Matter - material containing carbon, the cornerstone of plant and animal life. It originates from domestic and industrial sources.

Outfall - the place where effluent is discharged into receiving waters.

Plume - the rising discharge of treated effluent from a treatment plant outfall pipe.

Pretreatment - reduction or elimination of pollutant properties in wastewater prior to discharging the wastewater into a sewer system.

Privatization - the use of private contractors to perform tasks that customarily are the responsibility of government agencies.

Preliminary Treatment - the process of removing large solid objects, sticks, gravel, and grit from wastewater.

Primary Treatment - wastewater treatment afforded by sedimentation. It results in 50-60% removal of suspended solids and 30-34% removal of BOD.

Pumping Station - mechanical devices installed to push the sewage to a higher elevation.

Residuals - the by-products of the sewage treatment process, including scum (floatables), grit and screenings, primary sludge, and secondary sludge.

RMFP (Residuals Management Facilities Plan) - the MWRA's plan for the management of all residuals generated at wastewater treatment facilities in the MWRA service area.

Relief Sewer - a sewer built to carry the flows in excess of the capacity of an existing sewer.

Remote Headworks - the initial structures and devices of a treatment plant set apart by some distance from the plant site.

Safe Yield Model - the equation used to determine the maximum dependable draft that can be made continuously on a source of supply during a period of years during which the probable driest period or period of greatest deficiency in water supply is likely to occur.

Sanitary Sewers - in a separate system, pipes that carry only domestic wastewater.

Screenings - large items, such as wood and rags, that are collected from wastewater in coarse screens prior to primary treatment.

Scum - floatable materials such as grease, oil, and plastics that are skimmed from the surface of wastewater as it flows through large settling tanks.

Secondary Treatment - usually follows primary treatment. It employs microorganisms to further reduce the level of BOD in wastewater. Together, primary and secondary treatment result in an 85% reduction of both BOD and suspended solids.

Sedimentation Tanks - settling tanks which facilitate the removal of solids from sewage. The wastewater is pumped to the tanks where the solids settle to the bottom or float on the top as scum. The scum is skimmed off the top, and solids on the bottom are pumped out for further treatment and/or final disposal.

Septic Tanks - used for domestic wastes when a sewer line is not available to carry them to a treatment plant. Periodically, the septage is pumped out of the tanks, usually by commercial firms, and released into a wastewater treatment system.

Sewer Jet Truck - vehicle used to clean and/or remove blockages from sewer lines by pushing fluids in the sewer.

Shotcrete - mortar or concrete conveyed through a hose and projected at high velocity onto a surface; also known as air-blown mortar, pneumatically applied sprayed mortar, or gunned concrete.

Siphon - a closed conduit, a portion of which lies above the hydraulic grade line, resulting in a pressure less than atmospheric and requiring a vacuum within the conduit to start flow. A siphon utilizes atmospheric pressure to effect or increase the flow of water through the conduit.

Slip Lining - insertion by pushing or pulling of lines fabricated of plastic, concrete cylinder pipe, reinforced concrete, or steel through existing conduits from access pits.

Sludge - material removed by sedimentation during primary and secondary treatment. It includes both settled particulate matter and microorganisms and is the single largest component of wastewater residuals. At the time sludge is removed during the treatment process, it contains only .5% to 5% solid content by weight. It has the appearance of muddy water.

STFP - Secondary Treatment Facilities Plan, also known as the Deer Island Facilities Plan (see DIFP).

Storm Sewers - separate systems of pipes that carry only water runoffs from roofs, streets, and parking lots during storms.

Surcharging - loads on a system beyond those normally anticipated; the height of wastewater in a sewer manhole above the crown of the sewer when the sewer is flowing completely full.

Suspended Solids - the particulate matter contained in wastewater.

Telemetry - remote measuring or monitoring devices connected to a central monitoring station via telephone lines.

Transition - a short section of conduit used as a conversion section to unite two conduits having different hydraulic elements.

Underdrain Outlets - outlets from a drain that carry away groundwater or the drainage from prepared beds to which water or wastewater has been applied.

United States Geological Survey (USGS) - agency which collects Geographic Information System (GIS) data for developing mapping protocols.

Vactor Jet Truck - vehicle used to clean and/or remove blockages from sewer lines by pushing and/or pulling fluids in the sewer.

Wastewater - the water carried by sewers serving residences and businesses that enters wastewater facilities for treatment.

Wastewater Treatment Plan (WTP) - a series of tanks, screens, filters, and other equipment and processes for removing pollutants from wastewater.

APPENDIX G
CITY, TOWN/PROJECT

City or Town Project Number / Project	City or Town Project Number / Project
All MWRA Customers	Boston (Continued)
3101 North Maintenance Facilities	2311 Heath Hill Pipe Replacement
3102 Fore River Staging Area	2312 Southern Spine Distribution Mains
3103 Technical Assistance Contracts	2313 Blue Hills Covered Storage
3104 Business Systems Plan	2314 Southern Extra High - Sections 41 and 42
All Wastewater Customers	2315 Chestnut Hill Connecting Mains
1203 Deer Island Treatment Plant and Related Projects	2320 Rehab. of Other Pump Stations
1110 Siphon Chamber & Diversion Structure Rehab.	2324 WASM 4
1114 Corrosion and Odor Control Study	2325 Spot Pond Supply Mains
1115 Wastewater Facilities Rehabilitation	2329 New Connecting Mains - Shaft 7 to WASM 3
1301 Residuals Management Facilities	
1501 Infiltration/Inflow Local Financial Assistance Program	
All Water Customers	Braintree
2101 Drinking Water Quality Improvements (Wachusett)	1102 Braintree-Weymouth Relief Facilities
2201 MetroWest Tunnel	1111 Wastewater Metering System Upgrade
2202 Dam Control Valves	
2203 Sluice Gate Rehabilitation	Brookline
2302 Blow-off Valve Replacement	1104 Upper Neponset Valley Relief Sewer
2303 Cathodic Protection of Distribution Mains	1111 Wastewater Metering System Upgrade
2338 Hydraulic Model Update	1201 DI Remote Headworks Rehabilitation
2401 Central Monitoring System Expansion	2305 Boston Low Service and Valve Rehabilitation
2402 Rehabilitation of Existing Facilities	2309 Warren Cottage Line Rehabilitation
2403 Distribution Systems Facility Mapping	2310 Southern Service Improvements
2404 Local Water Infrastructure Rehabilitation Assistance Program	2311 Heath Hill Pipe Replacement
Arlington	2312 Southern Spine Distribution Mains
1108 Alewife Brook Parkway Pump St. Rehab.	2313 Southern Extra High - Sections 41 and 42
1111 Wastewater Metering System Upgrade	2315 Chestnut Hill Connecting Mains
1201 DI Remote Headworks Rehabilitation	2320 Rehab. of Other Pump Stations
2204 Northern Tunnel Loop	2325 Spot Pond Supply Mains
2320 Rehab. of Other Pump Stations	
2325 Spot Pond supply Mains	Burlington
2329 New Connecting Mains - Shaft 7 to WASM 3	1107 Cummingsville Branch Sewer
2337 Northern Extra High Service - New Pipelines	1201 DI Remote Headworks Rehabilitation
Ashland	Cambridge
1106 Framingham Extension Relief Sewer	1108 Alewife Brook Parkway Pump St. Rehab.
1111 Wastewater Metering System Upgrade	1113 System Master Plan Interceptors
1112 Ashland Extension Sewer	1201 DI Remote Headworks Rehabilitation
Bedford	1401 Combined Sewer Overflow Control Program (CSOs)
1201 DI Remote Headworks Rehabilitation	2307 Nonantum Road Pipe Rehabilitation
2204 Northern Tunnel Loop	2324 WASM 4
2320 Rehab. Other Pump Stations	2325 Spot Pond Supply Mains
2329 New Connecting Mains - Shaft 7-WASM 3	
2337 Northern Extra High Service - New Pipelines	Canton
Belmont	1103 New Neponset Valley Relief Sewer
1108 Alewife Brook Parkway Pump St. Rehab.	1111 Wastewater Metering System Upgrade
1201 DI Remote Headworks Rehabilitation	2310 Southern Service Improvements
2204 Northern Tunnel Loop	2312 Southern Spine Distribution Mains
2320 Rehab. Study Other Pump Stations	2313 Blue Hills Covered Storage
2329 New Connecting Mains - Shaft 7 to WASM 3	2314 Southern Extra High - Sections 41 and 42
2337 Northern Extra High Service - New Pipelines	2320 Rehab. of Other Pump Stations
Boston	Chelsea
1109 North Metropolitan Trunk Sewer Rehab. Phase II	1109 N. Metro. Trunk Sewer Rehab. Phase II
1201 DI Remote Headworks Rehabilitation	1111 Wastewater Metering System Upgrade
1203 DI Outfall Repair	1113 System Master Plan Interceptors
1401 Combined Sewer Overflow Control Program (CSOs)	1201 DI Remote Headworks Rehabilitation
2204 Northern Tunnel Loop	1401 Combined Sewer Overflow Control Program (CSOs)
2305 Boston Low Service and Valve Rehabilitation	2306 WASM 1 and 2 Rehabilitation
2306 WASM 1 and 2 Rehabilitation	2325 Spot Pond Supply Mains
2307 Nonantum Road Pipe Rehabilitation	2326 Northern Low Service Pipeline Replacement
2309 Warren Cottage Line Rehabilitation	2328 Northern Low Service Rehab. Sections 8 and 57
2310 Southern Service Improvements	Chicopee
	2102 Drinking Water Quality Improvements (Quabbin)
	2206 Chicopee Valley Aqueduct Interconnections

City or Town
Project Number / Project

Dedham

1103 New Neponset Valley Relief Sewer
 1104 Upper Neponset Valley Relief Sewer
 1105 Wellesley Extension Sewer Replacement
 1113 System Master Plan Interceptors

East Boston

1109 N. Metro. Trunk Sewer Rehab. Phase II
 2327 Water Main Relocation in Chelsea River Easement
 2328 Northern Low Service Rehab. Sections 8 and 57
 2331 Northern High Service Section 26 Revere
 2335 Northern High Service Pipe Impmt - Revere/ Malden
 2336 Northern High Service Pipeline Rehabilitation

Everett

1113 System Master Plan Interceptors
 1201 DI Remote Headworks Rehabilitation
 2306 WASM 1 and 2 Rehabilitation
 2325 Spot Pond Supply Mains
 2326 Northern Low Service Pipeline Replacement
 2328 Northern Low Service Rehab. Sections 8 and 57
 2336 Northern High Service Pipeline Rehabilitation

Framingham

1106 Framingham Extension Relief Sewer
 2104 Sudbury Watershed Protection

Hingham

1102 Braintree-Weymouth Relief Facilities

Holbrook

1102 Braintree-Weymouth Relief Facilities

Lexington

1201 DI Remote Headworks Rehabilitation
 2204 Northern Tunnel Loop
 2320 Rehab. of Other Pump Stations
 2329 New Con. Mains - Shaft 7-WASM 3
 2337 Northern Extra High Service - New Pipelines

Lynn

2323 Spot Pond Pump Station Rehab.
 2331 Northern High Service Section 26 Revere
 2332 Northern High Service Connecting Mains to Sec. 91
 2333 Northern High Service Pipe Impmts Lynn Pipeline
 2334 Northern High Service Section 27
 2335 Northern High Service Pipe Impmt - Revere/ Malden
 2336 Northern High Service Pipeline Rehabilitation

Lynnfield

2323 Spot Pond Pump Station Rehab.
 2332 Northern High Service Connecting Mains to Sec. 91

Malden

1111 Wastewater Metering System Upgrade
 1113 System Master Plan Interceptors
 1201 DI Remote Headworks Rehabilitation
 2204 Northern Tunnel Loop
 2306 WASM 1 and 2 Rehabilitation
 2323 Spot Pond Pump Station Rehab.
 2325 Spot Pond Supply Mains
 2328 Northern Low Service Rehab. Sections 8 and 57
 2335 Northern High Service Pipe Impmt - Revere/ Malden
 2336 Northern Extra High Service - New Pipelines

City or Town
Project Number / Project

Marblehead

2323 Spot Pond Pump Station Rehab.
 2332 Northern High Service Connecting Mains to Sec. 91
 2333 Northern High Service Pipe Impmts Lynn Pipeline
 2334 Northern High Service Section 27
 2335 Northern High Service Pipe Impmt - Revere/ Malden
 2336 Northern High Service Pipeline Rehabilitation

Marlborough

2104 Sudbury Watershed Protection

Medford

1108 Alewife Brook Parkway Pump St. Rehab.
 1111 Wastewater Metering System Upgrade
 1201 DI Remote Headworks Rehabilitation
 2204 Northern Tunnel Loop
 2306 WASM 1 and 2 Rehabilitation
 2323 Spot Pond Pump Station Rehab.
 2325 Spot Pond Supply Mains
 2326 Northern Low Service Pipeline Replacement
 2327 Northern Low Service Rehab. Sections 8 and 57
 2329 New Connecting Mains - Shaft 7 to WASM 3

Melrose

1201 DI Remote Headworks Rehabilitation
 2323 Spot Pond Pump Station Rehab.
 2325 Spot Pond Supply Mains

Milton

1103 New Neponset Valley Relief Sewer
 1111 Wastewater Metering System Upgrade
 1201 DI Remote Headworks Rehabilitation
 2310 Southern Service Improvements
 2312 Southern Spine Distribution Mains
 2313 Blue Hills Covered Storage
 2314 Southern Extra High - Sections 41 and 42
 2320 Rehab. of Other Pump Stations

Nahant

2323 Spot Pond Pump Station Rehab.
 2332 Northern High Service Connecting Mains to Sec. 91
 2333 Northern High Service Pipe Impmts Lynn Pipeline
 2334 Northern High Service Section 27
 2335 Northern High Service Pipe Impmt - Revere/ Malden
 2336 Northern High Service Pipeline Rehabilitation

Natick

1105 Wellesley Extension Sewer Replacement
 1106 Framingham Extension Relief Sewer
 1111 Wastewater Metering System Upgrade

Needham

1105 Wellesley Extension Sewer Replacement
 2324 WASM 4

City or Town
Project Number / Project

Newton

1104 Upper Neponset Valley Relief Sewer
1201 DI Remote Headworks Rehabilitation
2306 WASM 1 and 2 Rehabilitation
2307 Nonantum Road Pipe Rehabilitation
2315 Chestnut Hill Connecting Mains
2317 Newton Service Improvements
2318 Comm. Ave. Pump Station Modernization
2324 WASM 4
2325 Spot Pond Supply Mains
2329 New Connecting Mains - Shaft 7 to WASM 3

Norwood

1103 New Neponset Valley Relief Sewer
2310 Southern Service Improvements
2312 Southern Spine Distribution Mains
2313 Blue Hills Covered Storage
2314 Southern Extra High - Sections 41 and 42
2320 Rehab. of Other Pump Stations

Peabody

2323 Spot Pond Pump Station Rehab.
2332 Northern High Service Connecting Mains to Sec. 91
2333 Northern High Service Pipe Impmts Lynn Pipeline
2334 Northern High Service Section 27
2335 Northern High Service Pipe Impmt - Revere/Malden

Quincy

1101 Quincy Pump Facilities
1102 Braintree-Weymouth Relief Facilities
2310 Southern Service Improvements
2312 Southern Spine Distribution Mains
2313 Blue Hills Covered Storage

Randolph

1102 Braintree-Weymouth Relief Facilities

Reading

1201 DI Remote Headworks Rehabilitation

Revere

1109 N. Metro. Trunk Sewer Rehab. Phase II
1113 System Master Plan Interceptors
1201 DI Remote Headworks Rehabilitation
2306 WASM 1 and 2 Rehabilitation
2323 Spot Pond Pump Station Rehab.
2331 Northern High Service Section 26
2332 Northern High Service Connecting Mains to Sec. 91
2333 Northern High Service Pipe Impmt - Lynn Pipeline
2335 Northern High Service Pipe Impmt - Revere/Malden
2336 Northern High Service Pipeline Rehabilitation

Saugus

2323 Spot Pond Pump Station Rehab.
2331 Northern High Service Section 26 Revere
2332 Northern High Service Connecting Mains to Sec. 91
2335 Northern High Service Pipe Impmt - Revere/Malden
2336 Northern High Service Pipeline Rehabilitation

City or Town
Project Number / Project

Somerville

1108 Alewife Brook Parkway Pump St. Rehab.
1111 Wastewater Metering System Upgrade
1113 System Master Plan Interceptors
1201 DI Remote Headworks Rehabilitation
1401 Combined Sewer Overflow Control Program (CSOs)
2204 Northern Tunnel Loop
2306 WASM 1 and 2 Rehabilitation
2325 Spot Pond Supply Mains
2329 New Con. Mains - Shaft 7 to WASM 3

South Hadley & South Hadley Fire District No. 1

2102 Drinking Water Quality Improvements (Quabbin)
2206 Chicopee Valley Aqueduct Interconnections

Southborough

2104 Sudbury Watershed Protection

Stoneham

1103 New Neponset Valley Relief Sewer
1201 DI Remote Headworks Rehabilitation
2204 Northern Tunnel Loop
2321 Bear Hill Improvements - Section 29 Rehab.
2322 Bear Hill Covered Storage
2323 Spot Pond Pump Station Rehab.
2324 Spot Pond Supply Mains

Swampscott

2327 Spot Pond Pump Station Rehab.
2332 Northern High Service Connecting Mains to Sec. 91
2333 Northern High Service Pipe Impmts Lynn Pipeline
2334 Northern High Service Section 27
2335 Northern High Service Pipe Impmt - Revere/Malden

Wakefield

1201 DI Remote Headworks Rehabilitation
2321 Bear Hill Improvements - Section 29 Rehab.
2322 Bear Hill Covered Storage
2323 Spot Pond Pump Station Rehab.

Walpole

1103 New Neponset Valley Relief Sewer

Waltham

1201 DI Remote Headworks Rehabilitation
2204 Northern Tunnel Loop
2319 Lexington St. Pump Station Rehabilitation
2320 Rehab. of Other Pump Stations
2329 New Connecting Mains - Shaft 7 to WASM 3
2337 Northern Extra High Service - New Pipelines

City or Town Project Number / Project	City or Town Project Number / Project
Watertown	Winchester
1201 DI Remote Headworks Rehabilitation	1107 Cummingsville Branch Sewer
2204 Northern Tunnel Loop	1113 System Master Plan Interceptors
2306 WASM 1 and 2 Rehabilitation	1111 Wastewater Metering System Upgrade
2307 Nonantum Road Pipe Rehabilitation	1201 DI Remote Headworks Rehabilitation
2320 Rehab. of Other Pump Stations	2204 Northern Tunnel Loop
2324 WASM 4	2321 Bear Hill Improvements - Section 29 Rehab.
2329 New Connecting Mains - Shaft 7 to WASM 3	2323 Spot Pond Pump Station Rehab.
	2322 Bear Hill Covered Storage
	2329 New Connecting Mains - Shaft 7 of WASM 3
Wellesley	Winthrop
1105 Wellesley Extension Sewer Replacement	1109 N. Metro. Trunk Sewer Rehab. Phase II
1111 Wastewater Metering System Upgrade	1111 Wastewater Metering System Upgrade
	1201 DI Remote Headworks Rehabilitation
Weston	1203 DI Treatment Plant Outfall Repair
2204 Northern Tunnel Loop	2331 Northern High Service Section 26 Revere
2306 WASM 1 and 2 Rehabilitation	2335 Northern High Service Pipe Impmt - Revere/Malden
2324 WASM 4	2336 Northern High Service Pipeline Rehabilitation
2329 New Connecting Mains - Shaft 7 to WASM 3	
	Woburn
Westwood	1107 Cummingsville Branch Sewer
1103 New Neponset Valley Relief Sewer	1113 System Master Plan Interceptors
	1201 DI Remote Headworks Rehabilitation
Weymouth	2321 Bear Hill Improvements - Section 29 Rehab.
1102 Braintree-Weymouth Relief Facilities	2322 Bear Hill Covered Storage
	2323 Spot Pond Pump Station Rehab.
Wilbraham	
2102 Drinking Water Quality Improvements (Quabbin)	
2206 Chicopee Valley Aqueduct Interconnections	
Wilmington	
1201 DI Remote Headworks Rehabilitation	

APPENDIX H
PROJECT/CITY, TOWN

Project Number / Project	Community(s) Affected	Project Number / Project	Community(s) Affected
1101 Quincy Pump Facilities	Quincy	1113 System Master Plan	Cambridge Chelsea Dedham Everett Malden Revere Somerville Woburn Winchester
1102 Braintree-Weymouth Relief Facilities	Braintree Hingham Holbrook Randolph Weymouth Quincy	1114 Corrosion and Odor Control Study	All Wastewater Customers
1103 New Neponset Valley Relief Sewer	Walpole Stoughton Canton Norwood Westwood Dedham Hyde Park Milton	1115 Wastewater Facilities Rehabilitation	All Wastewater Customers
1104 Upper Neponset Valley Relief Sewer	West Roxbury Newton Brookline Dedham	1201 D1 Remote Headworks Rehabilitation	Arlington Bedford Belmont Boston Brookline Burlington Cambridge Chelsea Everett Lexington Malden Medford Melrose Milton Newton Reading Revere Somerville Stoneham Wakefield Waltham Watertown Wilmington Winchester Winthrop Woburn
1105 Wellesley Extension Sewer Replacement	Wellesley Needham Dedham	1201 Deer Island Treatment Plant and Related Projects	All Wastewater Customers
1106 Framingham Extension Relief Sewer	Framingham Ashland Natick	1301 Residuals Management Facilities	All Wastewater Customers
1107 Cummingsville Branch Sewer	Winchester Woburn Burlington	1401 Combined Sewer Overflow Control Prog. (CSOs)	Boston Cambridge Chelsea Somerville
1108 Alewife Brook Parkway Pump St. Rehab.	Medford Somerville Belmont Cambridge Arlington	1501 Infiltration/Inflow Local Financial Assistance Prog.	All Wastewater Customers
1109 N. Metro. Trunk Sewer Rehab. Phase II	East Boston Chelsea Revere Winthrop	2101 Drinking Water Quality Improvements (Wachusett)	All Water Customers
1110 Siphon Chamber & Diversion Structure Rehab.	All Wastewater Customers	2102 Drinking Water Quality Improvements (Quabbin)	South Hadley Chicopee Wilbraham
1111 Wastewater Metering System Upgrade	Arlington Ashland Braintree Brookline Canton Chelsea Malden Medford Milton Natick Somerville Wellesley Winchester Winthrop		
1112 Ashland Extension Sewer	Ashland		

<u>Project Number / Project</u>	<u>Community(s) Affected</u>	<u>Project Number / Project</u>	<u>Community(s) Affected</u>
2104 Sudbury Watershed Protection	Southborough Marlborough Framingham	2310 Southern Service Improvements	Brookline Milton Quincy Norwood Boston Canton
2201 MetroWest Tunnel	All Water Customers	2311 Heath Hill Pipe Replacement	Boston Brookline
2202 Dam Control Valve Replacement	All Water Customers	2312 Southern Spine Distribution Mains	Boston Brookline Milton Quincy Norwood Canton
2203 Sluice Gate Rehabilitation	All Water Customers	2313 Blue Hills Covered Storage	Quincy Milton Boston Canton Norwood
2204 Northern Tunnel Loop	Boston Weston Brighton Chestnut Hill Somerville Cambridge Medford Malden Arlington Belmont Lexington Bedford Waltham Watertown Winchester	2314 Southern Extra High - Sections 41 and 42	Norwood Canton Brookline Milton Boston
2206 Chicopee Valley Aqueduct Interconnections	Chicopee Wilbraham South Hadley Fire District	2315 Chestnut Hill Connecting Mains	Boston Brookline Newton
2302 Blow-off Valve Replacement	All Water Customers	2317 Newton Service Improvements	Newton
2303 Cathodic Protection of Distribution Mains	All Water Customers	2318 Comm. Ave. Pump Station Modernization	Newton
2305 Boston Low Service and Valve Rehabilitation	Boston Brookline	2319 Lexington St. Pump Station Rehabilitation	Waltham
2306 WASM 1 and 2 Rehabilitation	Boston Chelsea Everett Malden Medford Revere Somerville	2320 Rehab. Study of Other Pump Stations	Arlington Lexington Waltham Winchester Brookline Boston Milton Norwood Canton Belmont Watertown Bedford
2307 Nonantum Road Pipe Rehabilitation	Boston Cambridge Newton Watertown	2321 Bear Hill Improvements - Section 29 Rehab.	Stonham Wakefield Winchester Woburn
2309 Warren Cottage Line Rehabilitation	Boston Brookline	2322 Bear Hill Covered Storage	Stonham Wakefield Winchester Woburn

Project Number / Project	Community(s) Affected	Project Number / Project	Community(s) Affected
2323 Spot Pond Pump Station Rehab.	Lynn Lynnfield Malden Marblehead Medford Melrose Nahant Peabody Saugus Stoneham Swampscott Wakefield Winchester Woburn	2332 Northern High Service Connecting Mains to Sec. 91	Lynn Lynnfield Marblehead Nahant Peabody Revere Saugus Swampscott
2324 WASM 4	Boston Cambridge Newton Watertown * Also improves pressure to the Northern High Service Area in addition to source supply to all communities served by Spot Pond Supply Mains	2333 Northern High Service Pipe Impmts Lynn Pipeline	Marblehead Swampscott Nahant Peabody Lynn Saugus
2325 Spot Pond Supply Mains	Arlington Boston Cambridge Chelsea Malden Medford Somerville Everett	2334 Northern High Service Section 27	Marblehead Swampscott Nahant Peabody Lynn
2326 Northern Low Service Pipeline Replacement	Everett Medford Chelsea	2335 Northern High Ser. Pipe Impmt - Revere/ Malden	Malden Revere Lynn Winthrop East Boston Saugus Nahant Peabody Marblehead
2327 Water Main Relocation in Chelsea River Easement	East Boston Logan Airport	2336 Northern High Service Pipeline Rehabilitation	Everett Revere East Boston Winthrop Saugus Nahant Marblehead Lynn
2328 Northern Low Service Rehab. Sections 8 and 57	Malden Everett Chelsea East Boston Medford	2337 Northern Extra High Service - New Pipelines	Arlington Bedford Lexington Waltham
2329 New Con. Mains - Shaft 7-WASM 3	Boston Waltham Watertown Winchester Somerville Medford Arlington Belmont Bedford Lexington Newton	2401 Central Monitoring System Expansion	All Water Customers
2331 Northern High Service Section 26 Revere	Saugus Lynn East Boston Winthrop	2402 Rehabilitation of Existing Facilities	All Water Customers
		2403 Distribution Systems Facility Mapping	All Water Customers
		3101 North Maintenance Facilities	All MWRA Customers
		3102 Fore River Staging Area	All MWRA Customers
		3103 Technical Assistance Contracts	All MWRA Customers
		3104 Business Systems Plan	All MWRA Customers



